April 4, 1935

Mr. W. P. Whitsett
Van Nuys, California

Dear Friend:

Any person using this sales talk will get good results. It not only gives good logical reasons for purchasing a certificate, but creates a desire and an interest in the individual to own one. I believe any average man or woman can familiarize himself with this plan and be successful at selling almost any prospect.

"Mr. Paul--For fourteen years our business has been to capitalize the individual, in other words, assist the individual in setting up up a reserve fund for any purpose for which he may care to use it; setting himself up in a business; educational fund; future financial contingencies; or best of all a retirement income after his earning power ceases, due to old age, or sickness, etcetera. Now people turn to our type of investments, for they realize the vital necessity for a definite, systematic method, that will assure them a reserve fund for future emergencies, and for retirement income. Personally I believe that many people now in dire circumstances would find their financial condition entirely different had they taken advantage of such a program as we offer. Incidentally, Mr. Paul, age has no bearing on our program other than the fact that the younger a man is the less money it takes to build the same reserve, because, time is an important element. I presume you are in your middle thirties. Just what is your age, may I ask? (or whatever age he may be).

If you will follow the systematic plan my company offers, I'll prove to you, beyond a doubt that it takes very little money to provide a fund for emergencies that may come your way. If you will deposit say 33 cents a day, $10.00 a month, $116.00 annually this will purchase a $2,500.00 installment certificate; or you may pay for this just as fast as you wish. However, my Company will extend the courtesy and privilege of allowing you 180 months in which to pay, which is 15 years, if you so desire.

Depositing $116.00 annually, for 15 years, you will actually deposit $1,740.00. You will agree that if we only returned this amount to Mr. Average Man it would be a Godsend, as Mr. Average Man will not consistently save money without a definite program. However, we compound each and every deposit at approximately 4½% compound interest. It is hard to realize that the interest on this small amount of money over this short period of time will amount to $760.00. Please note that interest amounts to nearly half of the principal you have paid in, to be exact 44%.

It is really astounding isn't it, how interest piles up and surely you must agree with me that the time between your present age of 35 and the age of 50 will be your most productive period, and if you are to accumulate a reserve, now is the time to do it, so that at the age of 50 you will have a Cash Estate of $2,500.00 from the $1,740.00 you have paid in. (Show a sample certificate here, as you talk) Your part of the program is now completed, no further deposits necessary. You may take your $2,500.00, spend it or do as you please with it, or you can leave it with our company to continue to earn interest with the privilege of withdrawing the $2,500.00 at will. As long as you leave your $2,500.00 with our Company we will send you our check for the interest $112.50 a year or $9.17 a month. Your Cash Estate of $2,500.00 remains intact.

Now instead of drawing your interest suppose you let it remain with the Company to accumulate, you never add another dollar to this estate, it will surprise you to know that this $2,500.00 will grow to the astounding figure of $4,838.00 by the time you reach the age of 65. Remember this estate of $4,838.00 is still the result of only the $1,740.00 you originally paid in.

Now let us see the glorious picture before you. You may now sit back and receive a monthly income of $29.67 or $356.03 annually and a like amount guaranteed for 20 years, which makes a grand total of $7,120.60 that someone will surely draw. This entire amount is paid to you or your estate out of the original $1,740.00 invested."

The Security we set up for your protection is such that there is no question as to the future.

1. All deposits in the Provident are guaranteed by the U. S. Government.

2. If you should miss payments it only defers maturity date of certificate.

3. In case of total disability or death the Company will pay you, or your estate, the total amount paid in with interest at 3%.

Quickly review and close. If you cannot close at this time suggest the following remarks: Statistics show that 85% of the people at the age of 65 are dependent upon relatives, friends, or charity. 15% are self supporting. In which class do you want to be placed?

Ask prospect what he has saved from his earnings in the past. Nine times in ten he will say nothing, therefore he needs this plan.

Any financial institution, like the Provident, that has weathered this depression has proven to the world that its management is safe and sound. Has proven its ability to handle other peoples money beyond any question of doubt.

per acre foot for untreated water will probably result in the greatest possible revenue and the least tax cost during the early years of operation.

A treatment plant is being built on the premise that it will encourage the municipal and domestic consumption of water. This remains to be demonstrated. I personally am inclined to the view that it is more essential to conserve our funds and reduce the first cost as much as possible than it is to provide refinements that are desirable but that are not absolutely necessary. In my opinion the District's primary market for water during the first years of operation is going to be the agricultural demand for untreated water. During the early years of operation there will have to be a distribution of the cost between water rates and taxation. By increasing the total water revenue, the tax levy can be reduced. Here again this calculation depends on such intangibles as rainfall, population growth and the rate of expansion of the District. I firmly believe that the best interest of our communities and citizens lies in keeping the water rate low. The resulting growth of the District and the demands on the Aqueduct will eventually reduce the tax cost to the vanishing point.

A. Z. Taft, *President* W. P. Whitsett, *Vice-President* C. B. DeMille, *Vice-President*

San Fernando Valley—"What a story you have to tell!"

GREATER SAN FERNANDO VALLEY ASSOCIATION

Co-operating with city and county officers and other public groups for the speedy consummation of the major development projects, now under way, or proposed in the interest of San Fernando Valley.

Cor. Magnolia Ave. and Hollywood Way

BURBANK, CALIF.
Phone: BURBANK 903

O. J. RENFREW, *Executive Secretary*
GEORGE W. BUNTON, *Manager*

May 5, 1926.

Honorable W. P. Whitsett,
Van Nuys, Calif.

Dear Mr. Whitsett:

Your resignation under date of April 19th. was presented to the Executive Committee at its session last night and the same was formally accepted with regrets.

We take this opportunity of thanking you for the interest which you have shown in the general program of the Association and for your past cooperation. We hope that we may look forward to the time when you can find yourself in position to again identify yourself with the Association and the big work which it is engaged in for the material welfare of the Valley.

Your letter was addressed to President Taft at this office and was delayed in forwarding, which accounts for this apparent neglect in acknowledging.

With highest personal regards,

Yours sincerely,

GREATER SAN FERNANDO VALLEY ASS'N

BY O J Renfrew
O. J. Renfrew,
Executive Secretary.

OJR.LF
DIC. 4-4-26

San Fernando Valley! *What a story you have to tell!*

Putting Big Things Across in San Fernando Valley

UNTIL recently, the people of Los Angeles and vicinity were prone to think of San Fernando Valley as still in the agricultural era—still important only because of the marvelous productivity of her orchards and farms.

But those who are alive to recent developments are beginning to realize the full significance of this fact—that half the area of the City of Los Angeles lies in San Fernando Valley!

Do you fully appreciate what that means? It means that San Fernando Valley will be for Los Angeles what the Bronx has proved to be for New York—an outlet for her overflowing population. And what happened in the Bronx is going to happen in this Valley—a transformation from broad acres of farm and orchard land to thickly populated residential sections, suburban homes, thriving community business centers, outlying one, two and five-acre homesteads, all crossed and criss-crossed by modern boulevards, rapid transit lines and streets.

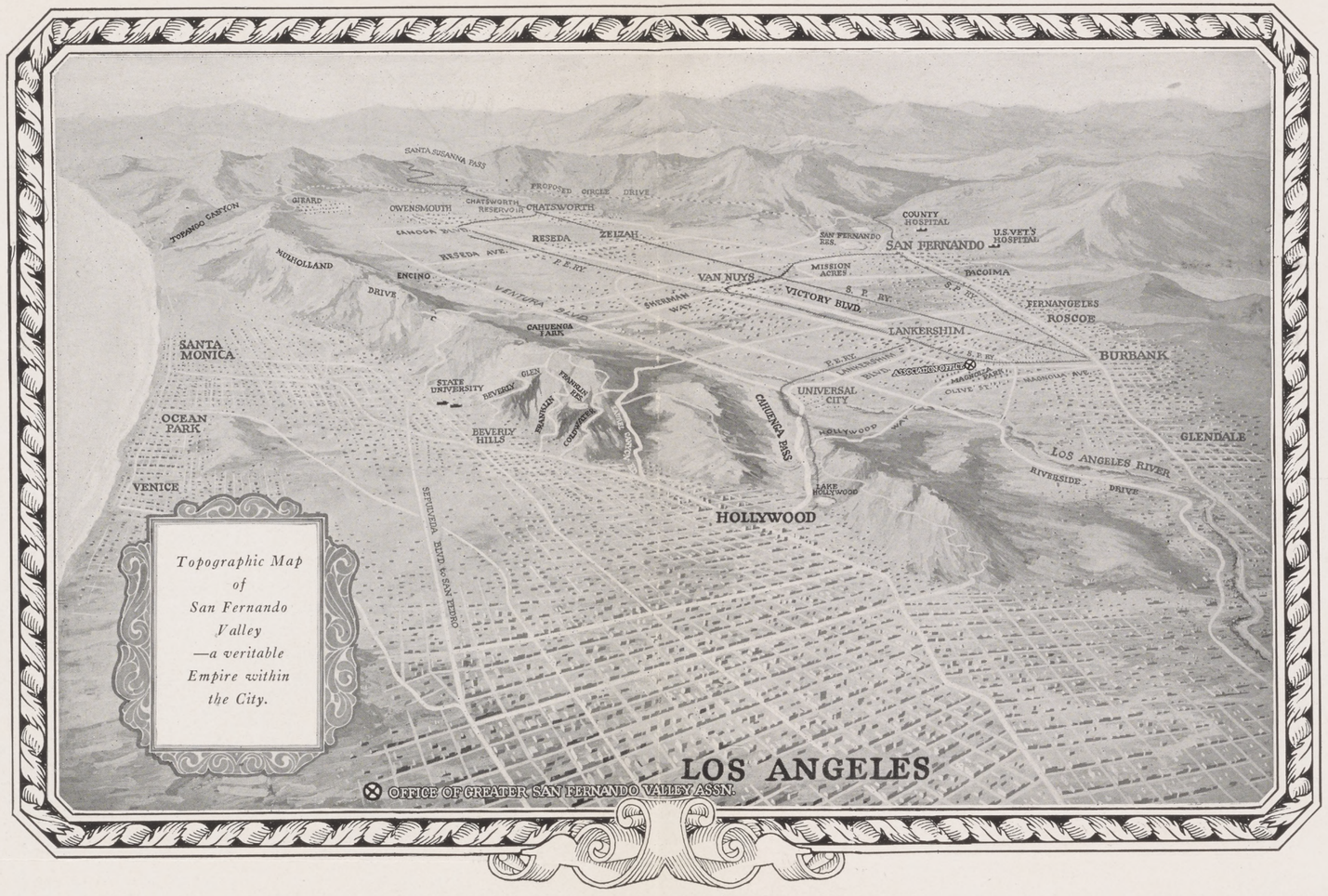
This development is already well advanced. In 1922 the population of San Fernando Valley was only 23,000. Today it is over 70,000. Within the Valley are a half score country clubs, two of the world's largest motion picture plants, industrial centers whose annual output runs into millions, half a dozen communities that are cities in themselves, and a buying power that has increased from $9,000,000 in 1922 to over $35,000,000 in 1925!

Organized to Further Progress

THE particularly fine thing is that the residents of the Valley realize to the fullest extent its potentialities and are imbued with an unconquerable determination to turn them into *realities*.

This strong public spirit crystallized some eighteen months ago into the formation of the GREATER SAN FERNANDO VALLEY ASSOCIATION. It found renewed expression when, at a recent meeting, the accomplishments of the Association were endorsed, its plans for the future approved and an enlarged executive committee and board of 100 directors declared themselves unreservedly to be at the service of the Association to carry out its program.

In the high character and devotion of its officers and directors, the GREATER SAN FERNANDO VALLEY ASSOCIATION has its greatest asset—its assurance of success. They represent every community and every section in the Valley. At the very outset of its career, the GREATER SAN FERNANDO VALLEY ASSOCIATION framed a definite program. You will find it outlined herein under "The Call of an Empire." You will see summarized "The Progress Thus Far," the accomplishments so far of the Association's program.



Progress Thus Far—What the Greater San Fernando Valley Association Has Done

PUT through the State Legislature "Assembly Bill 1085" amending the County Flood Control Act, which will save eight to ten years' delay in solving flood control problems and shown by recent action of the Board of Supervisors. Also assisted in securing passage of Mattoon Act and other useful public improvement laws.

Formulated complete Flood Control Program for the Valley which has been accepted by City and County officials and endorsed by numerous Civic Organizations. Already secured official assurance of permanent flood control of Los Angeles River; building of Big Tujunga Dam and run-off channels, conserving water and preventing destructive floods.

Association executives devoted fourteen weeks' continuous study and survey in conference with City and County Planning Commissions, resulting in adoption of an official plan of development of highways, transportation, industry, agriculture, etc.

First to advocate second road through Cahuenga Pass from Highland Avenue, Hollywood, to Vineland Avenue at Universal City, including widening of Pass Avenue through Dark Canyon to Burbank. The plans designed by this Association for the route, assessment district, rights-of-way, etc., for which nearly $3,000.00 was spent, have been accepted and proceedings are under way. The project will cost a million and a half of dollars.

It showed officials the supreme importance to Los Angeles of building Riverside Drive and which placed it among the first five projects of the Major Traffic Plan and designated in the first five million dollars bond issue, assuring final completion of this useful highway.

Sponsored councilmanic action discouraging annexations to Los Angeles, which would increase demands upon the City for water and cause further curtailment of Valley's supply for irrigation.

Endorsed and ardently worked for Colorado River legislation providing greater water and power supply.

Obtained official assurance that the Valley's rapid transit lines will be among the first built under the Kelker-DeLeuw plan. Secured appointment of a member of its Executive Committee upon the Rapid Transit Commission.

Through contact with banks, bond houses and various financial interests has brought new and greater capital investment into Valley enterprises. Well versed business men say that 80 per cent of the recent activity is due to the constructive work of this Association.

Advanced construction of Victory Boulevard. Already ten of the entire forty miles are paved and in use; Sepulveda Boulevard with four and one-half miles paved and open; the east extension of Mulholland Drive and the providing of $60,000.00 bridge bond money for viaducts across Cahuenga Pass; widening and paving San Fernando Road and Ventura Boulevard.

Brought to the Valley for inspections and conferences more than 1200 prominent men and officials of City, County, State and National Government, including Governor Richardson and the Southern California Editorial Association.

Held more than 200 conferences upon Valley problems. Secured more than 12,000 inches of newspaper and magazine publicity and advertising having a nominal value of $42,000.00.

Read This Important Announcement

San Fernando Valley will be visited on the afternoon and evening of July 2nd by more than 1000 editors from all points of the United States attending the National Editorial Association Convention in Los Angeles.

This Association has assumed the huge task of entertaining this great party for the purpose of placing San Fernando Valley before the "Eyes of the World." It will result in publicity of inestimable value.

These are just a few of the outstanding activities of the Association and show the measure of its usefulness.

Groundwork Well Laid

FROM the program outlined in "The Call of Your Valley" and the summary of progress made thus far, you can see that the groundwork for the realization of San Fernando Valley's possibilities has been well laid.

This being the case, the time has arrived for San Fernando Valley to tell its story to the world—a task upon which the Association is now concentrating.

If you are interested in checking up on conditions as they exist now in San Fernando Valley and following developments as they unfold, communicate with the office of this Association. We shall be glad to answer any inquiries and keep you closely in touch with every Valley activity in which you may be interested.

The Call of An Empire

"These are the things that will be done!"

1. **Flood Control**—A high dam for Big Tujunga Canyon; completion of Pacoima Dam; permanent channels for run-off waters through the valley; rock-revitted channel for Los Angeles River.
2. **Boulevards, Truck Highways, Bridges**—Completion of Riverside Drive, Victory and Sepulveda Boulevards; full capacity highways through Cahuenga Pass; widening and rebuilding Ventura Boulevard, San Fernando Road, Topanga Canyon; other new highways to Los Angeles as needed; truck highways; bridges for Riverside Drive, Victory Boulevard, Fletcher Avenue, Glendale and Hyperion Boulevards.
3. **Rapid Transit**—Elevated electric line along Los Angeles River from Glendale line, connecting with present P. E. valley tracks at Lankershim; adoption of a comprehensive Rapid Transit plan by the city.
4. **Sanitation, Sewage, Drainage**—Immediate formation of valley-wide sanitation district; construction of a complete trunk line sewer system; drainage channels as promised for Owensmouth and west-end district.
5. **Water Supply**—Conservation of flood waters; greater development of Owens Valley supply; better irrigation water deliveries; support of proposed Colorado River program.
6. **System of Park and Recreational Areas**—As outlined by Planning Commission; restoration of the Mission; proper recognition of valley's historic places.
7. **Building and Subdivision Restrictions**—Well ordered valley development; plan for development of open spaces as unique small acreage homes; proper limiting of town and business lot subdivision to the community and industrial centers.
8. **Industry and Agriculture**—Zoning of industrial areas; encouragement of industrial enterprise; extension of intensive small farm development under direction of planning commission.
9. **Civic Organization**—Efficient organization of all valley property owners and civic bodies into an aggressive and adequately financed association which will command the support of every citizen and enlist the active interest of men of energy, capital and vison, both inside and outside the valley.
10. **Advertising Program**—A powerful, sweeping campaign of advertising and publicity which will unite and stimulate loyal sentiment within the valley, proclaim to the world the financial, industrial, agricultural and residential supremacy of San Fernando Valley, and bring to it new capital, new residents and a tremendous new growth.

Officers and Directors of the Greater San Fernando Valley Association

Officers

A. Z. Taft, Jr. ..... *President*
W. P. Whitsett ..... *Vice-President*
Cecil B. DeMille ..... *Vice-President*
O. J. Renfrew ..... *Executive Secretary*
George W. Bunton ..... *Manager*

W. M. Bishop, Public Relations Consultant
L. S. Gillham Co., Inc., Advertising Counsel

Executive Committee

C. C. Bowerman
Hugo Carlson
C. Newell Carns
Harry H. Dace
R. H. Glenn
Robert L. Hanley
Alex Jeffrey
Henry P. Loomis
Walter Mendenhall
L. M. Rothenburg
Frank E. Slattery
A. Z. Taft, Jr.
Earl L. White
S. H. Woodruff
Chas. L. Wood

Directors

VAN NUYS

F. W. Berkshire
Harry A. Bevis
George A. Chapman
Frank Colgrove
Frank C. Cowdrey
J. R. Goldsworthy
Robert L. Hanley
Sarah Kellogg
Walter Mendenhall
Frank Slattery
A. E. Streeter
Tom H. Sweet
C. T. Wardlaw
W. P. Whitsett
R. J. Zarn

BURBANK

Frank E. Anderson
C. D. Ashbranner
L. H. Boydston
J. W. Charleville
J. C. Crawford
A. E. Dufur
L. A. Dymond
E. J. Jackson
Chas. H. Kline
L. A. Love
J. D. Radcliff
L. M. Rothenburg
F. M. Wellington
Earl L. White
Leonard Wilson
Dr. A. E. W. Yale

SAN FERNANDO

L. Q. Branson
Glenn C. Chamberlain
David C. Calderon
H. H. Dace
Mrs. Oda Faulconer
Mrs. Celia Flynn
R. H. Glenn
Frank J. Hendershot
F. A. Holden
Jack Keeley
Chester C. Knight
Henry P. Loomis
I. H. Malin
John W. Muckley
H. G. Muegge
H. J. Poppleman
Chas. H. Temple

ROSCOE

W. A. Craig
R. F. Wisel

HANSEN HEIGHTS

Frank Keniston

PACOIMA

Chas. L. Wood
Fred Westman
Mrs. Burney W. Starksen

OWENSMOUTH

H. W. Allen
M. A. Best
W. E. Bechtelheimer
W. J. Brown
D. H. Carlson
Hugo Carlson
H. B. Carter
Guy Crowley
Dr. W. H. Gundrum
Nat E. Heacock
J. S. McCrory
Prof. G. Walter Monroe
Wilbur Price
Chas. Weeks

LANKERSHIM

C. C. Bowerman
C. Newell Carns
W. J. Freedman
A. P. Fulcher
Mrs. Jennie H. Harwood
John F. Kegley
Donald H. Keith
Earl D. Killion
Harvey E. Oatman
Fred Scharold
Howard Seeley
Fred Weddington
Guy Weddington
Ray Whitson
Jim Wilson
Cecil Wilcox

FERNANGELES

Chester Gilmore

RESEDA

H. L. Cady
P. J. Deaux
W. L. Fletcher
A. E. Hartman
Alex Jeffrey
Wm. G. Lauesen
A. B. Pryor

CHATSWORTH

W. B. Browning
L. E. Hadley
R. Boyd Long

ZELZAH

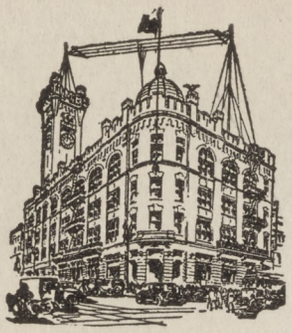
Glenn Allard

Greater San Fernando Valley Association

Cor. Magnolia Ave. and Hollywood Way

BURBANK, CALIF.

Phone: BURBANK 903



TIMES BUILDING
BROADWAY AT FIRST

OFFICE OF

The Times-Mirror Company

PUBLISHERS OF

Los Angeles Times

FOUNDED BY HARRISON GRAY OTIS, DECEMBER 4, 1881

LOS ANGELES, CAL.

OFFICERS AND DIRECTORS
HARRY CHANDLER
PRESIDENT AND GENERAL MANAGER
NORMAN CHANDLER
VICE-PRESIDENT
MARIAN OTIS-CHANDLER
SECRETARY
F. X. PFAFFINGER
TREASURER
MRS. MABEL OTIS-BOOTH
HARRY C. CARR

January 4, 1935.

Mr. W. P. Whitsett, President
San Fernando Valley Federal Savings
and Loan Association,
Van Nuys, California.

Dear Mr. Whitsett:

Mr. Chandler received your good letter of December 29th and read with interest the reported progress of your Loan Association. He asks us to extend congratulations for what you have achieved thus far and incidently asked if you are active in using the $5,000 appropriation in the Times, which was arranged between you. We informed him that you were doing a small amount of Classified advertising and he made the observation that perhaps it would be helpful to you, the Times and the community if you could see your way clear to start in an active advertising campaign, believing implicitly as he does in the value of the printed word in this great religious daily.

Mr. Chandler is impressed with the belief that we are on the eve of a tremendous small home building activity and that it just needs someone like yourself to start the ball rolling in a rapid fire manner.

I join Mr. Chandler in extending to you best wishes for a prosperous New Year.

Yours very truly,

THE TIMES-MIRROR COMPANY

By J. Baum
Business Manager

Refer to Mr. Sales

JB/gs

After the first six months, as the campaign begins to function, the five percent advanced on all sales, to be paid back pro-rata to the underwriting subscribers.

I will personally give such time as is necessary in managing these San Fernando Valley value creating activities , plans to be approved in advance by a Board of Control of five members to be selected by the twelve beneficial subscribers (after all advances have been repaid). In consideration of my time and work, any further profits which may accrue, one half to come to me and one half to the beneficial interests.

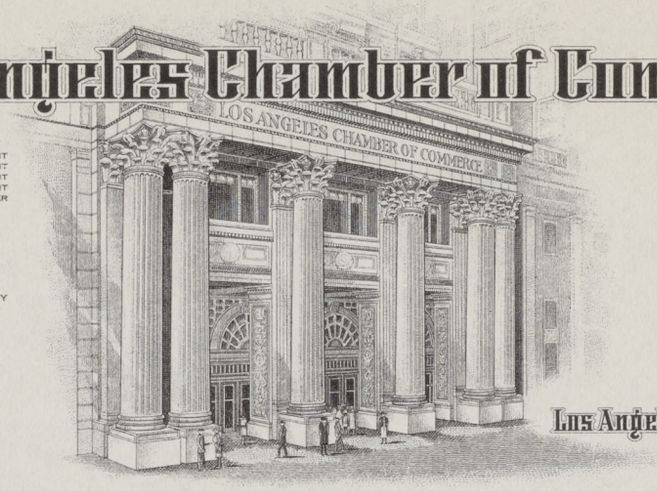
I feel this is an oppurtunity for service not only in preventing permanent distruction of present suburban home values, but in getting thrifty successful families of sufficient means established on the soil where they can provide their own food requirements when unemployed, thereby becoming supporters of conservative government in trying times like these.

Yours very truly,

WPW:C

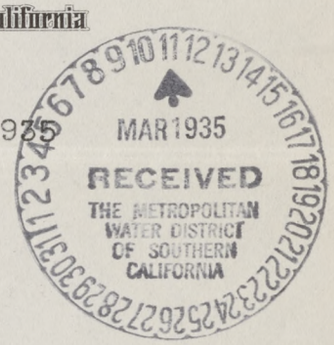
Los Angeles Chamber of Commerce

OFFICERS & DIRECTORS
WALTER J. BRAUNSCHWEIGER, President
R. L. McCOURT, BYRON C. HANNA, ROBERT LINTON, Vice Presidents
HARRY L. HARPER, Treasurer
JOHN C. AUSTIN, JAMES L. BEEBE, NORMAN CHANDLER, R. J. COPE, CECIL B. DEMILLE, S. E. GATES, W. I. HOLLINGSWORTH, WILLIAM A. HOLT, JOSEPH JENSEN, CHARLES S. JONES, A. N. KEMP, EDWIN J. LOEB, HENRY S. MACKAY, DONALD O'MELVENY, HERMAN PAINE, W. S. ROSECRANS, JAMES E. SHELTON, FRANK SIMPSON, JR., W. A. SIMPSON, GENERAL WALTER P. STORY, J. L. VAN NORMAN, DR. R. B. VON KLEINSMID, H. H. WETZEL
A. SCHLEICHER, Director
Chamber of Commerce of the United States
NELSON M. SAUNDERS
President, Junior Chamber of Commerce
ARTHUR G. ARNOLL
Secretary and General Manager
F. L. S. HARMAN
Assistant Secretary
Cable Address: CHAMBERCOM., Los Angeles



The City of Balanced Prosperity

Los Angeles, California



March 9, 1935

Mr. W. P. Whitsett, Chairman,
Metropolitan Water District,
Los Angeles, California.

Dear Mr. Whitsett:

I have read your radio talk, enclosed with your letter of March 8.

I have only one comment, which is that possibly our railroad friends might feel that other forms of transportation were played up to their disadvantage, although you mention the stream-lined trains.

Would it be possible for you to change this slightly and say that faster train schedules have made trans-continental travel possible?

Your statement is a splendid one, right to the point, and understandable by all.

Very truly yours,

LOS ANGELES CHAMBER OF COMMERCE

AGA:N

Secretary & General Manager

REPUBLICAN NATIONAL COMMITTEE

CHAIRMAN
HENRY P. FLETCHER

VICE CHAIRMEN:
RALPH E. WILLIAMS
MRS. ALVIN T. HERT
J. HENRY RORABACK

SECRETARY:
GEORGE DEB. KEIM
TREASURER:
GEORGE F. GETZ
GENERAL COUNSEL:
JOHN HAMILTON

CHARLES D. HILLES
MEMBER FOR NEW YORK

120 WILLIAM ST.
NEW YORK CITY



Air Mail.

August 15,1935

Harry Chandler, Esq.,
Los Angeles, California.

Dear Mr. Chandler:

The metropolitan water district of Los Angeles has secured a loan from the R.F.C. for the purpose of installing a cable to connect with the new aqueduct. Undoubtedly you are entirely familiar with the project, which is in charge of Mr. W.B. Whitsett, Chairman.

The cable transmission line for the Boulder Dam was manufactured by the General Cable Corporation. It was a special type of hollow core copper. Mr. Whitsett will invite proposals for supplying some 3,000 tons of this cable, and the General Cable Corporation is sending Mr. Dwight Palmer to Los Angeles in the hope that he may secure the order.

My interest in the matter is that I am a member of the Board of Directors of the General Cable Corporation, and naturally shall appreciate any courtesies that may be extended to Mr. Palmer.

With very best wishes, believe me,

Sincerely yours,

Charles D. Hilles

Dictated by Mr.Hilles,
but signed in his absence.

Dear Mr. Whitsett,
Every loyal citizen will look to you to buy all supplies where they can be had for lowest cost quality considered and I have no other suggestion to make. Yours, C.H.

WHT
9

County of Los Angeles
Board of Supervisors
Los Angeles

ROGER W. JESSUP
SUPERVISOR, FIFTH DISTRICT

MEMBERS of the BOARD
ROGER W. JESSUP
CHAIRMAN
WILLIAM A. SMITH
GORDON L. McDONOUGH
JOHN ANSON FORD
OSCAR HAUGE

August 15, 1939

AUG 1939
RECEIVED
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Mr. W. P. Whitsett, Chairman,
The Metropolitan Water District,
306 West Third Street,
Los Angeles, California.

Dear Mr. Whitsett:

I have just had an opportunity to read your fine paper on "The World of Tomorrow" and wish to commend you for its idealism, vision and faith in California.

I agree with the bright picture which you paint for our Promised Land here on the Pacific. The things which you predict are inevitable. My only wish is that we had more public spirited men like you to speed up the day when all these things will be realized.

Sincerely yours,

Roger W. Jessup

T. B. STRAIN, PRESIDENT
C. W. BATTEY, EXECUTIVE VICE PRESIDENT
EDWARD A. BECKER, SENIOR VICE PRESIDENT
WALKER S. BATTEY, VICE PRESIDENT
FRED S. ALDRICH, VICE PRESIDENT
HOWARD HADLEY, VICE PRES. - TRUST OFFICER

ELMER DEKAY, CASHIER
A. W. GRIFFIN, TRUST OFFICER
H. E. LEINBERGER, ASST. CASHIER
C. I. ANDERSON, ASST. CASHIER
H. C. CARL, ASST. CASHIER
VERN DEVORE, AUDITOR & COMPTROLLER

THE CONTINENTAL NATIONAL BANK OF LINCOLN

COMMERCIAL — TRUST — SAVINGS

LINCOLN, NEBRASKA

October
Third,
1947

To Our Correspondents:

A world in chaos, both economically and politically, is not a very pleasant thing to write about. Therefore, were it not for the fact that we have been reporting to you on our eastern trips for the past twenty years, I think it would be easier to pass up the report on the trip that Ed Becker and I have just returned from.

Our approach to the problem is in no wise pessimistic but rather an attempt to give you a realistic report on our findings in the hope that it may be of some value and help to you.

Naturally the thing that we are all concerned with is the increasing spiral of high costs within the country, namely, the cost of living as it reflects itself in wages, materials, supplies and equipment. The experience of everyone is the same and the margin of profit is fast diminishing. All those with whom we talked are concerned and believe the day of reckoning is near. The pattern is plain but not quite the same as 1920-1929 or 1933 and, therefore, no one would predict when the break would come. The break could be 25% or precipitous, depending on conditions.

Banks in New York and other large centers have been increasing rates on loans. Their reasons are along these lines. First, the Government has released the peg on Bills and Certificates and, as a consequence, rates on both have materially increased. Commercial paper rates on high-grade names are now prevailing at 1 1/8% to 1 1/4%. The long-term rate on Governments seems to be fixed but from a liquidity standpoint, maturities should not be stretched out too far. Rates on A-1 corporate bonds have strengthened and may increase more the spread between Governments. Municipal borrowing is increasing and the spread between them and Government bonds should be at least .20%. Maturities should be held fairly short because of marketability.

Because of economic conditions and possible shrinkage in commodity and inventory values, it would seem prudent to watch loans. Good margins should be maintained on collateral loans and the liquid position on open loans would seem important. Losses could occur and in the interim, examining authorities could demand charge-offs that would make inroads on reserves and capital structure, even though later recovered.

We are a part of the world, whether we want to be or not. Therefore, we will probably finance the 17 nations under some plan. The Marshall Plan, so little understood, provides four approaches to the problem:

(1) Encourages self help and asks these countries to increase their own production

(2) Asks these nations to standardize development within their several countries. The purpose being that they cannot stand alone

(3) Requests that they balance their own economy and create incentive for production

(4) Contemplates United States aid for the balance needed

The approach is both economic and political.

It seems to us that this support is needed unless we are to have further development of an economy so far removed from that of ours, the system of Free Enterprise.

Here at home our problems are big. We have much to do in the education of our people and that becomes a difficult thing to do in political years. Food costs alone today represent better than 50% of wages received. Rents have been low because of freezing, but still account for 10% to 15% of wages. This leaves a pitifully small part for taxes, clothing, sickness and savings. We are not in good condition to withstand a depression. Installment lending has increased, as has current accounts for goods. All this challenges the loaning officers in our commercial banks. Mortgage lending seems important in view of the housing shortage. Here again a credit problem, not only from the standpoint of loss but from actual condemnation of the banks later on the part of the borrower.

Again we say that this is not intended to be a pessimistic report. Rather we call your attention to the many real problems in the hope that it will be of help to you in your operations and the belief that it may help eliminate losses in the future.

We would be delighted to talk with you or answer any questions.

Sincerely yours,

T. B. Strain
President

TBS:LB

WHT
15

OCCIDENTAL COLLEGE
IN THE CITY OF LOS ANGELES
LOS ANGELES 41, CALIFORNIA

OFFICE OF THE PRESIDENT

September 16, 1954

Mr. William P. Whitsett
14547 Valley Vista Boulevard
Sherman Oaks, California

My dear Mr. Whitsett:

I am writing to express to you my very sincere regret that although I had accepted the opportunity to be present at the luncheon being given in your honor on September 23, I now find that I must be up north. The meetings to which I had intended to go later in the week have been re-scheduled for earlier in the week and, accordingly, I must leave here on Wednesday afternoon.

It is a distinct disappointment to me to miss the luncheon honoring you. You have done a great work in the Metropolitan Water District and in many, many other ways throughout Southern California in development and you deserve the recognition.

Tell your good lady that my wife has gone away on a trip to Europe. Perhaps she mentioned this when we were together that delightful evening in the summertime at your home. However, she sailed last weekend from New York for Sweden and will not be back here until nearly Thanksgiving time. Meanwhile I carry on at the College but at home I am alone.

With warm personal regardsto both of you,

Sincerely yours,

Arthur G. Coons

P.S. It is good to see Myrtle back in college.

WHT
15

LIONEL D. EDIE & COMPANY
INCORPORATED
INVESTMENT COUNSELORS · ECONOMIC CONSULTANTS
523 WEST SIXTH STREET
LOS ANGELES 14, CALIFORNIA

HOWARD D. MILLS
VICE PRESIDENT

~~MICHIGAN 7541~~
MADISON 6-8751

EXECUTIVE OFFICE
NEW YORK, NEW YORK

September 21, 1954

Dear Mr. Whitsett:

A speaking engagement in San Diego, Thursday, September 23rd, made several weeks ago, precludes my being present at the luncheon that day, dedicating the Whitsett Intake Pumping Plant of the Colorado River Aqueduct, in your honor.

I regret this exceedingly, and do not wish the event to pass without expressing my personal compliments to you.

While it has not been significant in any other way, the fact that I filled the vacancy on the Board created by your retirement has been an inspiration to me and has deepened my sense of responsibility as a member.

Next time our trails cross, I will do greater justice to my sentiments, and certainly will be with you in spirit Thursday noon.

Sincerely,

Howard

Mr. W. P. Whitsett
6703 Van Nuys Boulevard
Van Nuys, California

WHT
15

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
306 WEST THIRD STREET
LOS ANGELES 13, CALIFORNIA

OFFICE OF
BOARD OF DIRECTORS

September 21, 1954

Mr. W. P. Whitsett
14547 Valley Vista
Sherman Oaks, California

Dear Mr. Whitsett:

Enclosed is a copy of the letter received by Mr. Jensen from Samuel Morris. I am sending it to you because I think you will appreciate the compliment contained in the second paragraph, particularly coming from such an outstanding person as Mr. Morris.

I am looking forward to the big party on Thursday. To me it represents a culmination of some hopes and desires that have been in my mind for many years.

Yours truly,

A. L. Gram

A. L. Gram
Executive Secretary

Enclosure

C O P Y

September 16, 1954

Mr. Joseph Jensen, Chairman
Board of Directors
The Metropolitan Water District
of Southern California
306 West Third Street
Los Angeles 13, California

Dear Mr. Jensen:

Many thanks for including me in the luncheon honoring William P. Whitsett for whom the Intake Pumping Plant is to be named. I have received ticket for Thursday, September 23.

Mr. Whitsett gave energetic leadership to The Metropolitan Water District and the Colorado River Aqueduct during its entire formative and construction period. He very much deserves this high honor.

Sincerely,

Samuel B. Morris (signed)
General Manager & Chief Engineer

WHT
15

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
306 WEST THIRD STREET
LOS ANGELES 13, CALIFORNIA

OFFICE OF
BOARD OF DIRECTORS

September 29, 1954

Mr. W. P. Whitsett
14547 Valley Vista
Sherman Oaks, California

Dear Paul:

I want to acknowledge your letter of September 24 commenting on and expressing some of your reactions to the ceremonies on September 23, at which the Intake Pumping Plant was formally named in your honor. It was read at the Meeting of the Board of Directors yesterday, and your generous statements were thoroughly appreciated.

A number of letters are being received approving of the action of the District in naming the Intake Pumping Plant in your honor, and commenting on the appropriateness of the ceremonies. I have asked Mr. Gram to accumulate them and send them on to you.

Yours truly,

Joseph Jensen

Joseph Jensen
Chairman

Oct. 25, 1954

COPY

Mr. Joseph Jensen, Chairman
Board of Directors
Metropolitan Water District
Los Angeles 13, California

Dear Joe:

I have read with deep interest your address delivered at the Annual Meeting of the Petroleum Division of the American Society of Mechanical Engineers on Sept. 28th. The amount of detailed information, so clearly presented is amazing and invites my highest commendation.

Gram sent me some very nice letters, which you received following the Dedication Luncheon along with copies of your replies. Thank you for your thoughtfulness.

Enclosed find Whaley-Eatons latest report which I have marked, knowing how you will appreciate comments on national water shortage.

With best wishes always,

Sincerely,

W. P. WHITSETT

WHT
15

GEORGE L. EASTMAN
1131 NORTH HIGHLAND AVENUE
LOS ANGELES 38, CALIF.

September 22, 1954

Mr. W. P. Whitsett
14547 Valley Vista
Sherman Oaks, California

Dear Mr. Whitsett:

Because it is impossible for me to attend the luncheon given in your honor tomorrow, I do want to extend to you my very deep thanks as a citizen of Los Angeles, for the very unselfish and fruitful service you have rendered to the whole community of Southern California by your efforts on the Metropolitan Water Board.

The annual meeting of the Board of Directors of Pomona College is being held at Claremont tomorrow so it is impossible for me to be among those who will be honoring you on this very fine occasion.

My sincere wish is that you may have many, many more years of service to this community, and happiness for yourself and your family.

Cordially yours,

Geo. L. Eastman

WHT
15

SAMUEL B. MORRIS
GENERAL MANAGER
AND CHIEF ENGINEER
WILLIAM S. PETERSON
ASSISTANT GENERAL MANAGER
AND CHIEF ENGINEER
FRANK TWOHY
CONTROLLER

DEPARTMENT
OF
WATER AND POWER
THE CITY OF LOS ANGELES

BURTON S. GRANT
CHIEF ENGINEER OF WATER WORKS
AND ASSISTANT MANAGER
IVAN L. BATEMAN
CHIEF ELECTRICAL ENGINEER
AND ASSISTANT MANAGER
GEORGE C. SOPP
JOINT SYSTEM HEAD
AND ASSISTANT MANAGER

207 SO. BROADWAY
BOX 3669 TERMINAL ANNEX
LOS ANGELES, 54
MICHIGAN 4211

September 24 - 1954

Mr W P Whitsett
VAN NUYS
California

Dear Mr. Whitsett:

Just a word to express to you and to Mrs. Whitsett my most sincere congratulations upon the dedication of the Whitsett Intake Pumping Plant of the Colorado River Aqueduct, an honor which you so richly have earned.

It was my privilege to work with those who drafted and introduced The Metropolitan Water District Act in two sessions of the California Legislature and to become well acquainted with you and the other leaders who built the Colorado River Aqueduct, without which Los Angeles and Southern California could not have become the great business and industrial metropolitan community which has been attained.

The ceremony and your own response were splendid.

Sincerely,

Sam Morris

SBM
CRM

SAMUEL B MORRIS
General Manager & Chief Engineer

Oct. 8, 1954

COPY

Mr. Samuel B. Morris
General Manager & Chief Engineer
Dept. of Water & Power
Los Angeles 54, Calif.

Dear Mr. Morris:

Your fine letter of Sept. 24th is greatly appreciated.

Well do I remember the valuable contribution you made in getting through legislation which set up the Metropolitan Water District as a civic unit ready for action.

Then Stanford University took you away from us, using your talents over a period of years during which Los Angeles missed you!

We feel fortunate to have you serving as head of our most vital Department - Water & Power.

With good wishes always,

Sincerely,

W. P. WHITSETT

WHT
15

THE C. W. PIERCE SCHOOL OF AGRICULTURE

A Junior College

Canoga Park, California

EDWIN B. ANGIER
Director

ALEXANDER J. STODDARD
Superintendent of Schools

September 27, 1954

Dear Mr. Whitsett:

It was indeed a privilege to be included in the luncheon in your honor given by the Board of Directors of the Metropolitan Water District. No one was more proud than I was of your great accomplishments since you had a great deal in molding whatever little success that I have had. I shall always be grateful for the first job you secured for me through the State Department at the time Mr. Hecke was the director.

The generation to come will never forget your pioneering and untiring efforts in behalf of the citizens of this great area.

I do hope that this Fall you and Mrs. Whitsett can find time to visit the college. We are very happy with a very definite increase in enrollment.

My kindest regards to you and Mrs. Whitsett.

Cordially,

Ed Angier

Director

Mr. W. P. Whitsett
14547 Valley Vista
Sherman Oaks, California

WHT
15

2446 CHISLEHURST DRIVE · HOLLYWOOD 27, CALIFORNIA

September 29, 1954

Answered

Congratulations, dear, dear friend: How happy you must be with all these well-deserved honors.

Please tell your handsome Sweetheart how proud we are of him.

I miss you, dear.

Your devoted,

"Dear Pearle"

Pearle Aikin-Smith.

2446 Chislehurst Drive,
Hollywood 27, California

Mrs. William Paul Whitsett,
6615 Van Nuys Boulevard,
Van Nuys, California.

THW
15

2446 CHISLEHURST DRIVE · HOLLYWOOD 27, CALIFORNIA

September 29, 1954

Congratulations, dear, dear friend: How happy
you must be with all these well-deserved honors.

Please tell your handsome Sweetheart how proud we
are of him.

I miss you, dear.

Your devoted,

"Pearl Aikin"

Pearle Aikin-Smith.

2446 Chislehurst Drive,
Hollywood 27, California

Mrs. William Paul Whitesett,
6615 Van Nuys Boulevard,
Van Nuys, California.

WHT
15

ROYAL W. SORENSEN, E. E. D.Sc.

PROFESSOR OF ELECTRICAL ENGINEERING EMERITUS
CALIFORNIA INSTITUTE OF TECHNOLOGY

FELLOW, A. I. E. E.
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA
ELECTRICAL - 1, CIVIL - 5188

RESIDENCE
3855 SO. HOLLISTON AVE.
PASADENA 5, CALIFORNIA

October 4, 1954

Mr. William P. Whitsett
14547 Valley Vista
Sherman Oaks, California

Dear Mr. Whitsett:

Congratulations and Good Wishes! You certainly merited the honor of having the Metropolitan Aqueduct Intake Plant named the Whitsett Intake Pumping Plant. It's duty, starting the Colorado River waters on the way to Southern California, will be an everlasting reminder of the pumping Mr. Whitsett did in getting human beings started in constructing the Metropolitan Aqueduct.

I have always taken great pride in knowing that the Board had enough confidence in me to invite me to be one of a board of consulting engineers for the project. Few events have been as pleasing as the visit you and Mr. Honold made to the Athenaeum when you extended to me that invitation. It was indeed a great honor to be one of that consulting board, the other members of which are men of such outstanding abilities.

It was also a great honor to be present at the dedication luncheon September 23 and to greet you in person. I was delighted to see you looking so well, and Mrs. Sorensen and I extend to you our best wishes that you may long enjoy the water which comes to the homes of millions by means of the service of the Whitsett Intake Pumping Plant.

Sincerely yours,

R W Sorensen

R. W. Sorensen

RWS/ajg

Oct. 8, 1954

COPY

Dr. Royal W. Sorensen
384 S. Holliston Ave.,
Pasadena 5, California

Dear Dr. Sorensen:

Thank you for your fine letter of October fourth. It means a lot to me, - coming with more than generous praise from one of Cal Tech's greatest engineers!

Without consultants possessing your experience and highly developed scientific knowledge - along with others like the late Franklin Thomas, who served as my vice-chairman, we "human engineers" could not have gone far.

Every great achievement involves many, and various talents from honest men whose lives are dedicated to service.

So I feel humbly grateful for the high honors given me, and share them in my heart with all my co-workers.

With sincere appreciation,

W. P. WHITSETT

WHT
15

FLORIDA EAST COAST RAILWAY COMPANY
JOHN W. MARTIN, TRUSTEE

OFFICE OF
JOHN W. MARTIN
TRUSTEE

P. O. Box 1259
JACKSONVILLE 1, FLORIDA

October 6, 1954.

Mr. and Mrs. W. P. Whitsett,
1454 Valley Vista,
Sherman Oaks, California.

Dear Ida and Paul:

Lottie and I were delighted that you sent us the clipping of Paul receiving the photograph of himself, and the nice write-up in the paper giving account of him having been honored by the authorities of the Metropolitan Water District. Also the menu of the dinner in his honor.

You know I am not a Frenchman, but I have always had not only an affection but the highest admiration for Paul. He is a kindly man, a gentleman, and a man of lots of ability. I knew that as soon as I talked to him; it is a pleasure to be with him and around him. He has done something more than marvelous for the people of that section of the nation; he has left his mark on the face of this universe.

The building of that aqueduct is an accomplishment of great magnitude, foresightand judgment, and long after he, you and I have gone from the affairs of this busy life and have forgotten, his achievement will live on for the good and betterment of mankind. Frankly, I am proud that he is my cousin. He is a wonderful character. And now, you are a great old girl yourself but you never have a word to say (do you) - you know all ladies like to talk - I was simply being facetious.

Lottie and I have never been to the West Coast; I hope some of these days we can make the trip; but I am now the sole Trustee of the Florida East Coast Railway, and with my work on my own property and all of the responsibilities of this railroad, I am kept pretty busy.

Lottie had a fall not long ago and because of that her knee has developed arthritis and she has suffered considerably from it, but she is much better. We went to Boston

and New York for a few days but had to come home on account of it, but I am glad she is so much better. You know in operating this entire East Coast, and the responsibility being on my shoulders alone, and with law suits and trying to erect depots in Fort Lauderdale, Miami and other places, I really have been working.

Will you tell Paul I understand that there are more quail in Florida this year than there have been for years, and I have the finest lot of dogs I have ever had - around 30, and to come down and hunt with me. We can ride in my hunting wagon and get out when they point, and shoot.

With love to you both from Lottie and me, I am

Affectionately,

John W Martin

Your Cousin.

WHT
15

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
306 WEST THIRD STREET
LOS ANGELES 13, CALIFORNIA

OFFICE OF
BOARD OF DIRECTORS

October 14, 1954

Mr. W. P. Whitsett
14547 Valley Vista
Sherman Oaks, California

Dear Mr. Whitsett:

In accordance with Mr. Jensen's instructions as contained in his letter to you, dated September 29, 1954, I am enclosing letters which he received following the ceremonies at which the Intake Pumping Plant was named in your honor. Also enclosed are copies of the letters of acknowledgment.

I think you will particularly appreciate some of these letters and probably would like to have them for the file Mr. Funk is accumulating.

Yours truly,

A. L. Gram

A. L. Gram
Executive Secretary

Enclosures:

Richard R. Lyman	B. O. Miller
Mrs. Wm. A. Burk	David L. Wilkes
Samuel B. Morris	Mildred L. Lillie
Ezra B. Rider	Leiland Atherton Irish
Grace M. Dreier	Marjorie Lenz

WHT
9

WILLIAM S. PETERSON
GENERAL MANAGER
AND CHIEF ENGINEER

BURTON S. GRANT
ASSISTANT GENERAL MANAGER
AND CHIEF ENGINEER

FRANK TWOHY
CONTROLLER

DEPARTMENT
OF
WATER AND POWER
THE CITY OF LOS ANGELES

SAMUEL B. NELSON
CHIEF ENGINEER OF WATER WORKS
AND ASSISTANT MANAGER

IVAN L. BATEMAN
CHIEF ELECTRICAL ENGINEER
AND ASSISTANT MANAGER

GEORGE C. SOPP
JOINT SYSTEM HEAD
AND ASSISTANT MANAGER

207 SOUTH BROADWAY
P. O. BOX 3669 TERMINAL ANNEX
LOS ANGELES 54, CALIFORNIA

TELEPHONE: MICHIGAN 4211

October 8, 1955

Mr. William P. Whitsett
6703 Van Nuys Boulevard
Van Nuys, California

Dear Mr. Whitsett:

I am greatly honored by the generous words of your letter of September 2 written to the Department on the occasion of my retirement.

There is noone who has contributed more effectively toward security adequate water supplies for Southern California than you have. As a former Commission of the Department of Water and Power and your many years of service as Chairman of the Board of Directors of The Metropolitan Water District, you have given evidence of your devotion and leadership to the community.

Sincerely,

Samuel B. Morris

SAMUEL B. MORRIS

SBM:aer

WHT
15

JOHN T. HAYS
1845-1919
WILL H. HAYS
1879-1954
HINKLE C. HAYS
JOHN S. TAYLOR
JOHN T. HAYS
GARZA BALDWIN, JR.
GEORGE E. TAYLOR
WILLIAM M. EVANS

HAYS & HAYS
LAWYERS
SULLIVAN, INDIANA

1300 CIRCLE TOWER
INDIANAPOLIS 4, INDIANA

WILLIAM P. EVANS
COUNSEL

Sullivan, Indiana
January 16, 1956

Mr. and Mrs. W. Paul Whitsett
14547 Valley Vista Boulevard
Sherman Oaks, California

Dear Ida and Paul:

This will acknowledge Ida's note of the 10th enclosing the account of the last of the many parties given in honor of Paul's 80th birthday. I would have liked to have been present at this one and responded to a toast on the subject--"W. P. Whitsett man and American." You know, Ida, he is--Mr. American. He is the type that made this country possible and it was this country that made him possible. I would give my life to preserve their joint rights. Lucile joins me in appreciation for the clipping. We are going to depend on your promise never to get near Sullivan without stopping to see us.

On the 25th we hope to leave for Daytona Beach, Florida. We are stopping this year at the Daytona Plaza Hotel. We left the Princess Issena because the manager there went to the Daytona Plaza and we went with the manager. If you get near there, call on us, without fail. I may have to return North at anytime by plane or train but the last trip will be on April 4, when Lucile comes back and I have promised to make that trip with her. In the meantime she will be there all the time and I will be there as much as I can.

With warm regards and cordial good wishes, I am

Affectionately,

HCH:RCB

CALIFORNIA COLLEGE OF MEDICINE
1721 GRIFFIN AVENUE
LOS ANGELES 31, CALIFORNIA

OFFICE OF THE PRESIDENT

December 27, 1962

W. P. Whitsett, LL.D.,(Hon.)
14547 Valley Vista
Sherman Oaks, California

Dear Doctor Whitsett:

You will find enclosed your honorary degree diploma, issued in the new name of the college as you requested. It has given us great pleasure through the years to know that you are an honorary alumnus and we trust you will be as proud of this diploma as we are of you.

We are sorry to hear of your current indisposition and sincerely hope it will be of short duration. We shall always be interested in you and your welfare. If you should ever find it possible to visit our school, please know that the latch string will always be out for you.

Yours truly,

President

W. Ballentine Henley:jm
Enc.

Letter of July 29, 1931

From

A. L. Sonderegger, Consulting Engineer

to

W. P. Whitsett,

Chairman, Board of Directors

In regard to the

EFFECT OF A FAVORABLE BOND ELECTION

ON THE

LOCAL WATER SITUATION

Letter of July 29, 1931

From

A. L. Sonderegger, Consulting Engineer

to

W. P. Whitsett,

Chairman, Board of Directors

in regard to the

EFFECT OF A FAVORABLE BOND ELECTION

ON THE

LOCAL WATER SITUATION

A. L. SONDEREGGER
Consulting Engineer

925 Central Building
Los Angeles

July 29, 1931

W. P. Whitsett, Chairman,
Metropolitan Water District
of Southern California,
Los Angeles, California.

Dear Sir:-

Herewith is submitted a brief report bearing on certain phases of the water situation of the Metropolitan Area which will develop during the next six or seven years, that is, between now and the time when the Colorado River water becomes available, and on the probable effect of any further delay in the construction of the Aqueduct should the Metropolitan bond election fail to carry at this time.

The drought to which this country has been subjected since 1922, combined with a steadily increasing demand for water, is making itself felt to an accelerating degree, so that in certain regions water shortages or exhaustion will become acute before the arrival of Colorado River water, even under normal conditions of rainfall. In fact, in some localities, the present season has already produced this very condition.

The areas affected receive their water supply mainly from groundwater sources; they are shown on attached Plate #1 and include the following:

1. An area of 41 square miles along the seaboard from Santa Monica to Alamitos Bay, where sea water is intruding progressively; indicated in vertical shading.

2. An area of 192 square miles between the seaboard and the Beverly Hills-Signal Hill-Newport Beach oil anticlinal (shown in horizontal shading) where static groundwater levels are at or below sea level and pumping levels correspondingly lower. This area is, therefore, subject to the intrusion of salt water. The water users in this area are not organized and water development still unrestricted.

3. An area along the foothills from Glendora to Etiwanda, where groundwater basins are of comparatively limited capacity and in danger of exhaustion. This condition affects about 34,000 acres in citrus and the domestic water supply of Glendora, La Verne, Claremont, Pomona, Ontario and Upland.

4. A portion of La Habra Basin, near Whittier, which is supplied from local groundwater.

5. The Orange County Coastal Plain. A portion of this basin (37 square miles) has water levels at or below sea level; it supplies the regions of Costa Mesa, Newport Beach and Laguna. Another portion of 160 square miles, with static water levels between sea level and 30 feet above sea level, has experienced a steady recession of water levels for some years and is rapidly approaching a critical condition; this affects the water supply of the cities of Santa Monica, Anaheim, Huntington Beach, etc., and a large agricultural district with citrus

the predominant crop.

The above named regions are now being compelled to look for new sources of supply in adjacent basins where larger groundwater storage permits of continued overdraft.

As far as Los Angeles County is concerned, such storage is found in San Gabriel Valley, San Gabriel Coastal Plain and Los Angeles Coastal Plain. However, these basins have, since 1922, derived all, or a large part, of their use from continued overdraft. This condition has made itself felt in a marked recession of water levels, a drying up of gravity supplies and consequently a greatly increased cost of production, all of which has impressed itself upon the minds of the water users and made them more apprehensive than ever of any attempt at encroachment on their rights.

With water at a premium today, and in face of increasing demands, it is expected that exports from these basins would be resisted on the ground that no surpluses exist. However, it is probable that a successful bond election and a prompt start of construction work on the Aqueduct not only would allay any apprehension, which is now manifest as to water supplies even in the large basins, but it might also pave the way to temporary exports to adjacent suffering areas, because relief would be in sight within a definite period.

On the other hand, should construction of the Aqueduct be delayed, due to failure of the bond election, the resulting uncertainty in the water situation would make itself

felt immediately in higher premiums on available local supplies, in a still more tense situation as regards the protection of existing rights by the many conflicting interests, and in a concerted resistance to any attempt at new exportations into other basins, regardless of the critical state of their supplies.

Even within the larger basins, where overdrafts for the time being are not disastrous, a marked conflict of interests is now developing between the rights of overlying lands (or correlative rights), and rights by appropriation. The division of interests is tending to line up the agricultural lands in opposition to the increasing development of industry and municipalities, whose concentration of large abstractions on small areas is out of all proportion to the correlative rights in the basin.

Because of the progressive increase of industrial and municipal needs, some water users will sooner or later find their rights in jeopardy and will eventually be forced to protect themselves by instituting general adjudication proceedings. The disastrous effects of such procedure cannot be over-estimated, because it would, of necessity, involve entire basins. The filing of a suit would immediately affect land and water titles to every parcel of land in the basin; the litigation would be protracted and very costly, and for the time being would put a stop to any development involving the investment of large capital, regardless of the final out-

come. The latter reference applies particularly to prospective basic industries which require large water supplies, and for which clear land titles could not be delivered until the termination of the water litigation. This type of industry has formed the backbone of the growth of recent years.

With an abundant supplementary supply in sight within a definite period, the danger of a permanent shortage vanishes and with it the cause for extensive litigation. It is, therefore, important that the construction of the Aqueduct be undertaken without delay, so that the continued progressive growth be not disturbed.

Referring to conditions in Los Angeles County, Plate #1 shows that the San Gabriel Valley and the Coastal Plain are surrounded by areas whose supplies are either in a critical condition or are rapidly approaching it, even under normal rainfall.

The present drought began in 1922 and has now continued for 9 years, with 1927 a wet year. The resulting water supply, as represented by the runoff of characteristic streams, was 59%. There is positive proof that Southern California has experienced longer periods of drought; two of these, one from 1893 to 1904 and the other from 1868 to 1883, were within periods during which rainfall records were kept, while a third, that of 1781 to 1809, is proved by historic evidence. In the report of H. B. Lynch, the statement is made that Lake Elsinore, at the end of this latter period, had dried to a swamp

about one mile long, whereas no such condition existed at the end of the other two periods cited, being positive proof that this early period exceeded in severity any other known period. The water crop of these periods of drought, expressed in percentage of the 38 year mean stream runoff from 1893 to 1931, is as follows:

1922-1931	dry	period	of	9	years,	water	supply 59%
1893-1904	"	"	"	11	"	"	" 53%
1869-1883	"	"	"	14	"	"	" 68%
1781-1809	"	"	"	28	"	"	" 70%

While it is expected that the present drought will not continue, nevertheless, past precedents indicate that such a possibility must be reckoned with. It has been proved that the present drought is also affecting the Owens River supply, so that its continuance would create critical conditions affecting the larger portion of Southern California, including the city of Los Angeles.

The conclusion is inevitable, that only actual construction work on the Colorado River Aqueduct will have the psychological effect of allaying fears and producing the assurance that permanent relief is definitely provided for.

- - - -

THE EFFECT OF ADJUDICATION OF WATER RIGHTS.

An adjudication of the water rights of a basin generally involves a determination of the following:

1st - Available local water supply:

2nd - Extent of irrigable and inhabitable areas overlying the basin:

3rd - Existing prescriptive rights, including those of municipalities, factories and irrigated lands, and of exporters.

4th - The determination of the correlative right in the total water supply of each acre of land overlying the basin. This amount, determined and confirmed by court decree, defines the extent of future water development of any parcel.

In the adjudication of groundwater supplies, municipal development comes under the category of appropriations, because a municipality cannot act for the lot owners within the city limits collectively, nor can a municipality file on groundwater supplies for future growth. Similarly, a factory which develops water in excess of the correlative right of its tract, becomes an appropriator.

It is generally admitted that local sources are insufficient to supply all irrigable or inhabitable lands overlying Southern California basins, so that even under original conditions and before appropriations took place, the correlative right of an acre of land was less than the consumptive use of its crop, or less than 1¼ ac.ft. per acre. Under the historical development as it occurred in Southern California, large prescriptive rights have been acquired, by usage, over periods exceeding five years, by municipalities, factories and irrigated lands, some of which may lie entirely outside of the basin. These rights, in case of an adjudication would also be prorated at

the expense of the other lands in the basin, so that the resulting correlative right per acre would be less than under original conditions.

The initiation and consummation of adjudication proceedings would successively produce the following disastrous conditions:

1st - It would involve every acre of land in the basin in a costly law suit, whether it wanted it or not.

2nd - It would tie up water rights and render the value of lands uncertain, beclouding, for the time being, all titles.

3rd - It would stop major developments during the process of the suit because of the uncertainty of water supplies.

4th - After an adjudication, new appropriations could be successfully enjoined so that the acquisition of large water rights would then be contingent upon the control of a corresponding area of land, generally in proportion of not less than one acre of land per acre foot of water per annum. Under such conditions, the development of a water supply of 50 miners inches, or 724 ac.ft. per annum by a municipality or factory would require the acquisition or control of a tract of land of not less than 724 acres, clearly an impossible

situation in a rapidly growing industrial country, when it is considered that the average value of such lands is not less than $1,000 per acre.

A further complication may arise in the adjudication of the water rights of Southern California basins, because basins are, as a rule, interconnected and overlapping, the supply of upper basins affecting that of those below. Excepting isolated cases, the adjudication of rights of an individual basin within a watershed will likely lead to that of the entire watershed. This would refer particularly to the San Gabriel Valley and San Gabriel Coastal Plain which are in the watershed of the San Gabriel River. The adjudication of the rights of the entire watershed of this river would be a matter involving a period of years and large expenditures of moneys. Similarly, the adjudication of the water rights of Orange County would likely involve the entire Santa Ana River Watershed.

AREAS AFFECTED BY SEA WATER.

The areas affected by the intrusion of sea water are located along the seaboard from Santa Monica to Long Beach and to Newport Beach, and are delineated on the attached Plate #1 in vertical shading, from information obtained from the Water Resources branch of the State Department of Engineering and from the Los Angeles County Flood Control office. Available analyses indicate that the water supply within the area desig-

nated has suffered a percolation inland of sea water to the extent of producing a salt content of 14 grains, or more, per gallon, as compared with fresh water supplies farther inland, which contain as little as one grain per gallon. Fourteen grains to the gallon does not necessarily mean that the waters are unfit for domestic or irrigation uses, but is indicative of a more or less progressive intrusion of sea water, so that it becomes merely a matter of time before the water will be unfit for use.

The area indicated by vertical shading on the map as containing 14 or more grains of salt per gallon, covers 41 square miles and at present affects the development of water supply within the cities of Venice, El Segundo, Manhattan Beach, Hermosa, Redondo, San Pedro, Wilmington, Long Beach and Seal Beach. It is concluded that these areas will have to be supplied permanently with imported water, unless it is found feasible to push the salt water back by restoration inland of the original fresh water gradient. The area now penetrated by sea water covers 41 square miles. There are two small areas in the vicinity of Santa Fe Springs which show salt water, probably due to leakage from oil wells.

AREAS WITH WATER TABLES AT OR BELOW SEA LEVEL.

The areas in which the water table is at or below sea level are also located along the seaboard from Santa Monica to Long Beach and to the mouth of the Santa Ana River. They are indicated on Plate #1 in horizontal shading and cover 155

square miles in Los Angeles County, with an estimated population of over 200,000 and 9,000 acres of irrigated lands and present abstractions of over 40,000 ac.ft. per annum. The respective area in Orange County is 37 square miles.

The basic information as to the extent of these areas has again been obtained from recent well surveys by State and County authorities, which show that static levels in certain wells are as low as 51 feet below sea level and in a great number of wells are more than 10 feet below sea level, with pumping levels correspondingly lower. There is, therefore, being produced today a marked counter gradient in the groundwater table favoring the percolation inland of salt water, because there are no physical barriers. This condition affects the water supply of Santa Monica, Venice, El Segundo, Hawthorne, Manhattan Beach, Hermosa, Redondo, Gardena, Wilmington, San Pedro, portions of Long Beach, Seal Beach, Newport Beach and Laguna.

It is apparent that although these basins have considerable fresh water stored below sea level, this storage can be utilized only to a very limited extent and that ordinary prudence makes it advisable that pumping be temporarily abandoned so that a natural recharge by fresh water can take place. Once salt water has intruded into an area, its replacement by fresh water becomes a difficult and slow process, because of the higher specific gravity of salt water, its lower viscosity and consequent relatively low rate of percolation. It is a problem the solution of which as yet has not been attempted.

It should be noted that the area from Santa Monica to Long Beach is situated southwesterly of the oil anticlinal, which extends from Beverly Hills to Signal Hill, and to Newport Beach, and therefore involves a basin separate from the Los Angeles County Coastal Plain and Orange County Coastal Plain. There are several gaps in this anticlinal, through which water percolates southwesterly into the western coastal plain, but apparently not sufficient in quantity to meet present abstractions. The area also receives a water supply during heavy rainstorms. However, the surface soils are generally heavy and tight, resisting free percolation. The Los Angeles County Coastal Plain is the only available source for a substitute water supply for the seaboard areas of Los Angeles County, and it is expected that the invasion of that plain on a large scale will have to be attempted long before completion of the Aqueduct.

OVERDRAWN AND EXHAUSTED FOOTHILL BASINS.

This applies to the foothill areas from Glendora to Claremont and the Cucamonga Basin. These areas are shown on attached Plate 1 in inclined heavy shading, indicating an overdraft.

The water users along the foothills from Glendora to Etiwanda have lately banded themselves together in a volunteer organization and after investigation of their water needs have publicly stated that in this area there are over 34,000 acres in citrus groves which use approximately 66,300 ac.ft.

per annum and domestic water uses by cities of 7800 ac.ft., making a total of 74,100 ac.ft. They have furthermore stated that the history of the water supply in this section is one of diminishing supply and, in some cases, nearing exhaustion, and that the annual overdraft at present is in excess of 50,000 ac.ft.

The area affects the domestic water supply of the cities of Glendora, La Verne, Claremont, Pomona and Ontario. The capacity of individual basins along these foothills is comparatively small. This fact, combined with an overdraft and the absence of recharge over a series of dry years has produced critical conditions which demand immediate attention.

The Glendora-Claremont area is tributary to the San Gabriel river and relief, therefore, must be looked for by an invasion of San Gabriel Valley groundwater storage. The Cucamonga Basin between Claremont and Etiwanda is in the watershed of the Santa Ana river and adjacent to the Chino Basin from whence it could obtain a supplementary supply.

The Whittier and La Habra Valley is also overdrawn to such an extent as to require importation of water from the San Gabriel and Santa Ana rivers.

LARGE STORAGE BASINS OF SAN GABRIEL VALLEY AND COASTAL PLAIN OF LOS ANGELES COUNTY.

The large groundwater basins underlying these areas are interconnected at the Whittier Narrows, both on the surface and underground. They will permit of overdrafts for some years to come, although at the expense of gravity supplies and a gen-

eral lowering of water levels.

As far as the Coastal Plain is concerned, overdrafts below sea level will not expose these areas to the intrusion of sea water for some years to come, because of the protecting barrier of the oil anticlinal. While several gaps exist in this ridge which extend to depths below sea level and permit the escape of groundwater, the exercise of reasonable caution should prevent the advance of the sea water area inland through these gaps.

In the San Gabriel Valley during the last four years, water levels have receded materially and the surface flow at the Whittier Narrows has diminished to the extent of as much as 2,000 inches. This gravity supply has been replaced by pumped water. The rapidity with which wells have been dropping indicates that the farther down a basin is drawn, the more rapidly does it approach exhaustion. The large underground storage of San Gabriel Valley represents the only logical relief available for the foothill areas of Los Angeles County. Temporary invasion might be tolerated were permanent relief from Colorado River water in sight.

The Los Angeles County Coastal Plain is supplied by the Los Angeles and San Gabriel Rivers, the latter being the major source. The facility with which water supplies have been developed on this plain and the comparatively low cost have been factors favoring the location of industries. Despite the fact that no water shortage need be feared, the increased cost

of production and competitive concentrated abstractions by municipalities and industries have created a disturbed situation and attempts at export would undoubtedly be resisted by this basin, especially if intended to be permanent. Certain exports to Torrance have been legalized by beneficial use over a period of years.

It may be mentioned that some of the larger water users of San Gabriel Valley and Los Angeles County Coastal Plain have organized themselves into the San Gabriel Valley Protective Association which employs a well-organized staff of engineers and three law firms to protect the water rights of their members.

ORANGE COUNTY

A survey of groundwater conditions in the Orange County Coastal Plain during the fall of 1930 is available in the report of the Orange County Flood Control District, dated April, 1931.

On the attached Plate #1, the areas where water stands at or below sea level are shown in vertical shading, they cover 37 square miles; those areas where the water table stands between sea level and elevation plus 30, are shown in inclined heavy shading, indicating an overdraft and comprise 160 square miles. This Coastal Plain is more exposed to the inland percolation of sea water than is that of Los Angeles County, because the gaps in the oil anticlinal are wider and located along the

beach. The wells at the mouth of the Santa Ana River, which serve Newport Beach, Costa Mesa and Laguna, are only one mile from the ocean and are now pumping from below sea level.

There has been a sharp drop in the water plane from 1922 to 1930 as shown on Plate #2, amounting to 120 feet near Anaheim, 15 miles inland. The winter of 1930-31 having been a dry one, the water table is now below that indicated on the diagram. It is estimated that in 1930 the basin was overdrawn to the extent of 31,500 ac.ft. The population at that time was 116,000 and the irrigated area 125,000 acres.

The steady recession of the water table is the result of a drought, combined with increasing abstractions over a long period of years, not only in Orange County, but also in Riverside and San Bernardino Counties, which have a first chance at the water supply of the Santa Ana River. It is expected that with continued growth in these three counties, groundwater levels will continue to recede and drop below sea level over large areas before Colorado River water becomes available. It will require concerted action and much forethought by the water users to tide over the interim without a serious setback in the growth of the county, as it is expected that exportation from the Los Angeles County Coastal Plain will not be tolerated. Orange County also is making a bid for industrial development which, in turn, may require comparatively large water supplies for individual factories and concentrated abstractions at rates many times those for ordinary agricultural

uses.

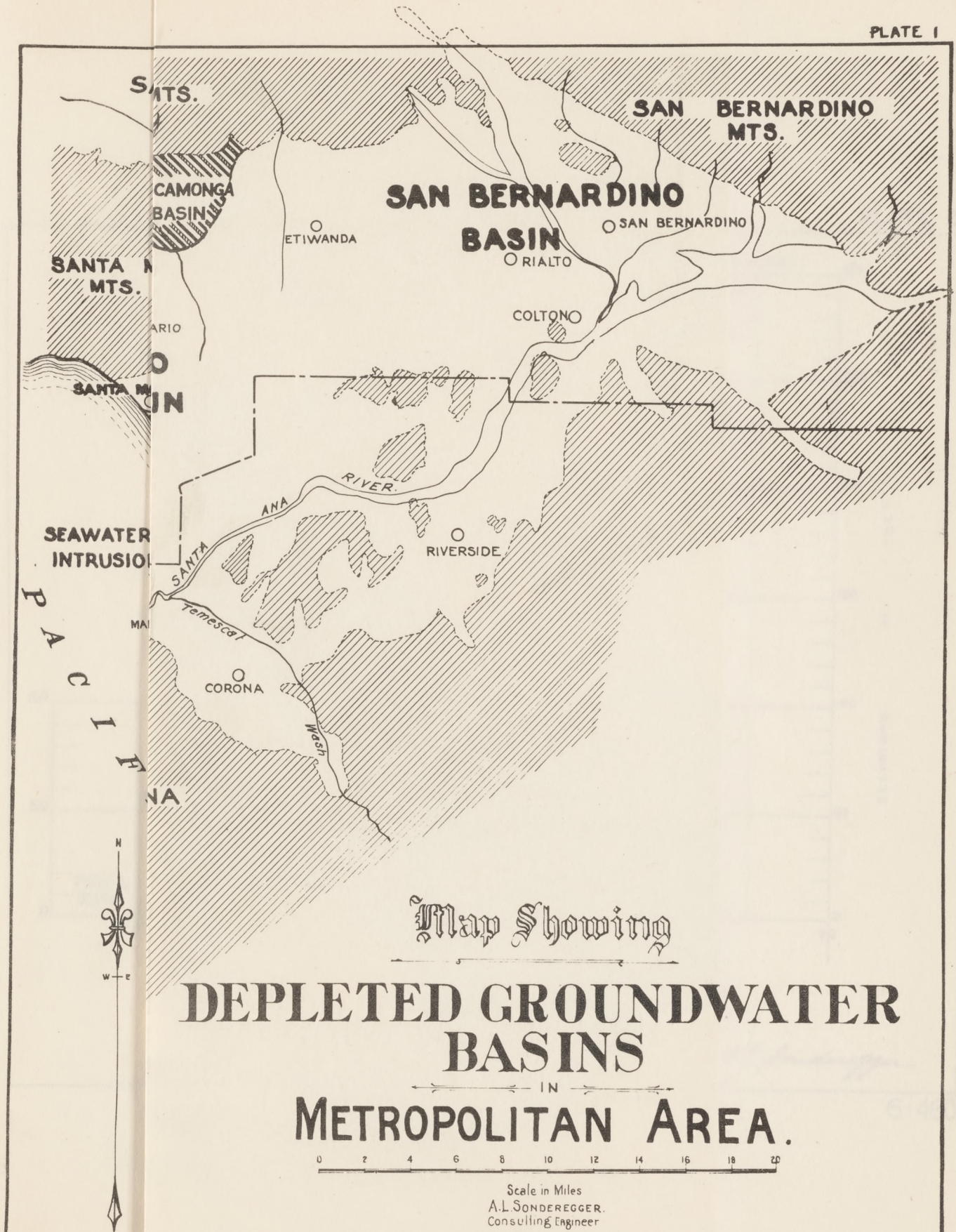
An adjudication of rights would have the same far-reaching results in Orange County as in Los Angeles County, and in particular would interfere with municipal and industrial growth.

Respectfully submitted,

(Signed) A. L. Sonderegger.

ALS:Y

DEPLETED GROUNDWATER BASINS METROPOLITAN AREA



Map Showing

DEPLETED GROUNDWATER BASINS

IN

METROPOLITAN AREA.

0 2 4 6 8 10 12 14 16 18 20

Scale in Miles

A. L. SONDEREGGER.
Consulting Engineer
525 Central Bldg. Los Angeles.

AUGUST 1931

SAN FERNANDO VALLEY
LOS ANGELES RIVER
GLENDALE
PASADENA BASIN
SIERRA MADRE
MONROVIA
PASADENA
ARCADIA
AZUSA
SAN MARINO
SAN GABRIEL
SAN GABRIEL VALLEY
SAN GABRIEL MTS.
GLENDORA-CLAREMONT BASIN
CUCAMONGA BASIN
UPLAND
CLAREMONT
ETIWANDA
SAN BERNARDINO MTS.
SAN BERNARDINO BASIN
SAN BERNARDINO
RIALTO
SANTA MONICA MTS.
BEVERLY HILLS
ALHAMBRA
EL MONTE
COVINA
WEST COVINA
MONTEREY PARK
SAN JOSE HILLS
POMONA
ONTARIO
COLTONO
CHINO BASIN
CHINO
SANTA MONICA
LOS ANGELES
LOS ANGELES
VERNON
WHITTIER NARROWS
SAN JOSE Creek
RIO HONDO
GABRIEL RIVER
PUENTE HILLS
LOS ANGELES CO. LINE
ORANGE COUNTY
SAN BERNARDINO COUNTY LINE
SANTA ANA RIVER
INGLEWOOD
OIL
SOUTHGATE
COUNTY
LYNWOOD
COASTAL PLAIN
SAN GABRIEL
LA HABRA
RIVERSIDE
SEAWATER INTRUSION
WATER TABLE AT OR BELOW SEA LEVEL
EL SEGUNDO
MANHATTAN BEACH
HERMOSA
REDONDO
COMPTON
ANTI
CLINAL
Temescal Wash
CORONA
ANAHEIM
ORANGE COASTAL COUNTY PLAIN
SANTA ANA MTS.
SAN PEDRO HILLS
LONG BEACH
SEAWATER INTRUSION
SAN PEDRO
HUNTINGTON BEACH
COSTA MESA
NEWPORT BEACH
PACIFIC OCEAN

LEGEND

- SALTWATER INTRUSION 14 GR. PER GALLON OR MORE } --41 SQ. MILES
- WATERTABLE AT OR BELOW SEA LEVEL } ---192 SQ. MILES
- GROUNDWATER SUPPLY APPROACHING CRITICAL CONDITIONS...220 SQ. MI.
- GROUNDWATER SUPPLY HEAVILY OVERDRAWN } ...120 SQ. MILES

Map Showing

DEPLETED GROUNDWATER BASINS IN METROPOLITAN AREA.

0 2 4 6 8 10 12 14 16 18 20

Scale in Miles

A.L. SONDEREGGER.
Consulting Engineer
925 Central Bldg. Los Angeles.

AUGUST 1931

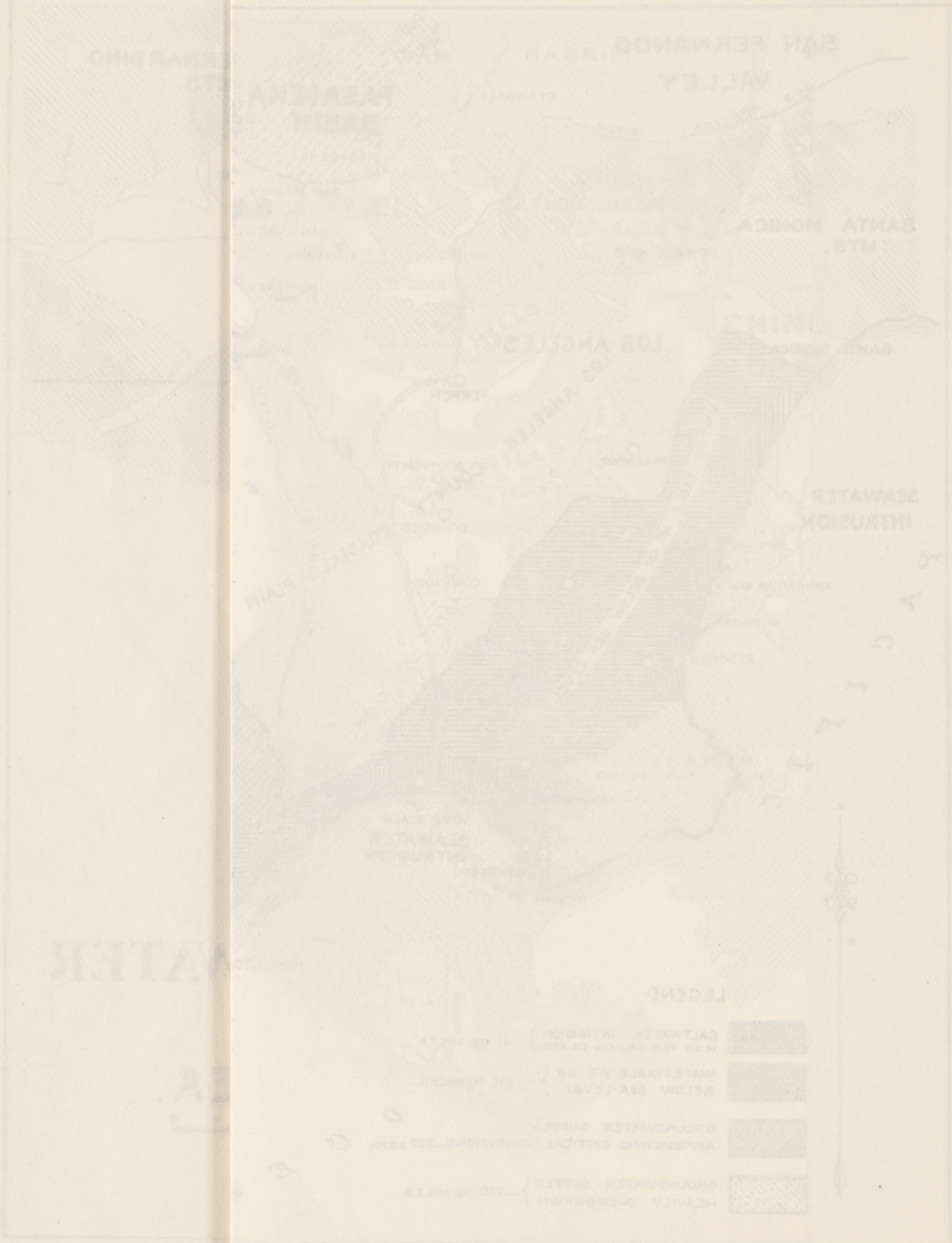
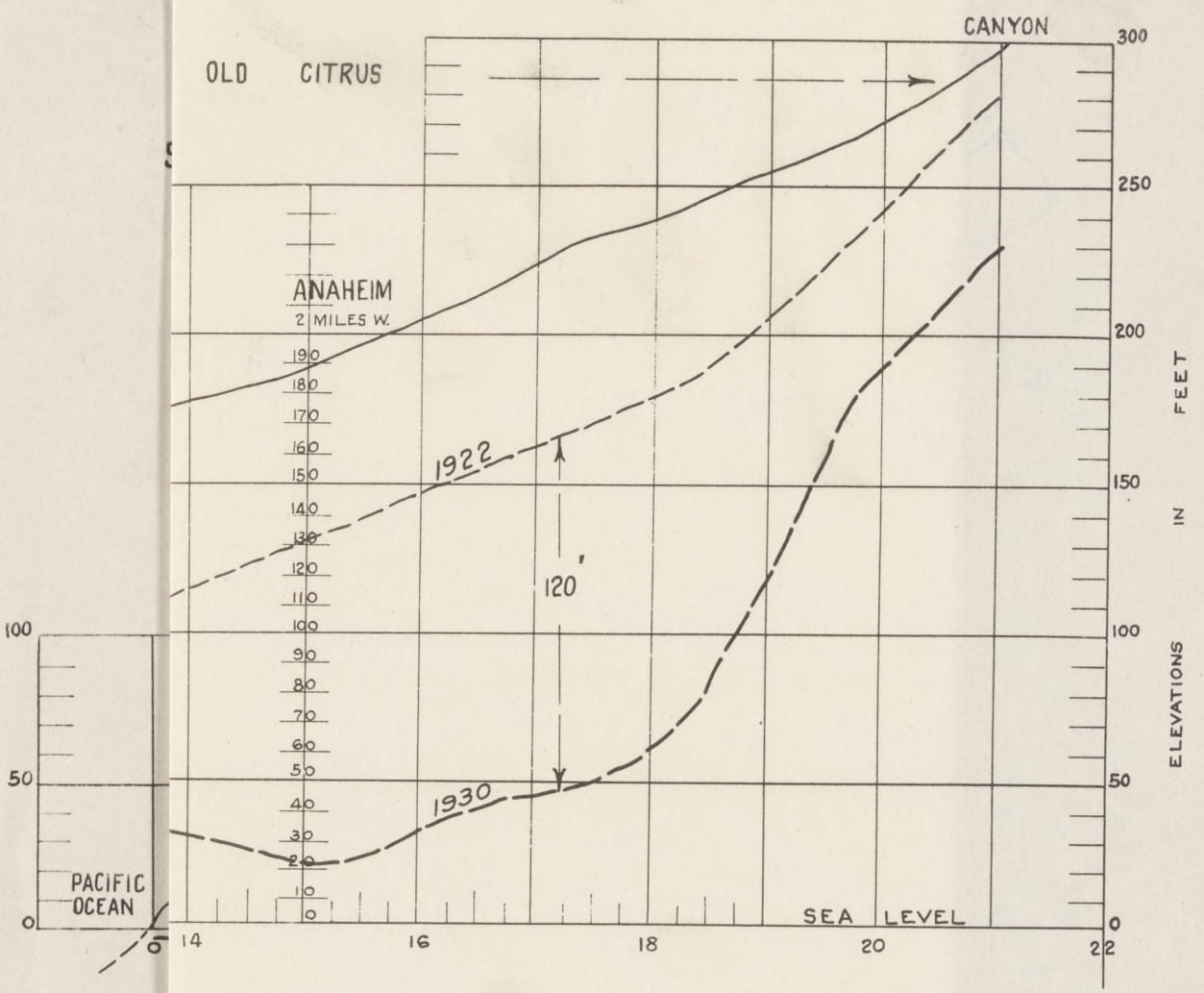
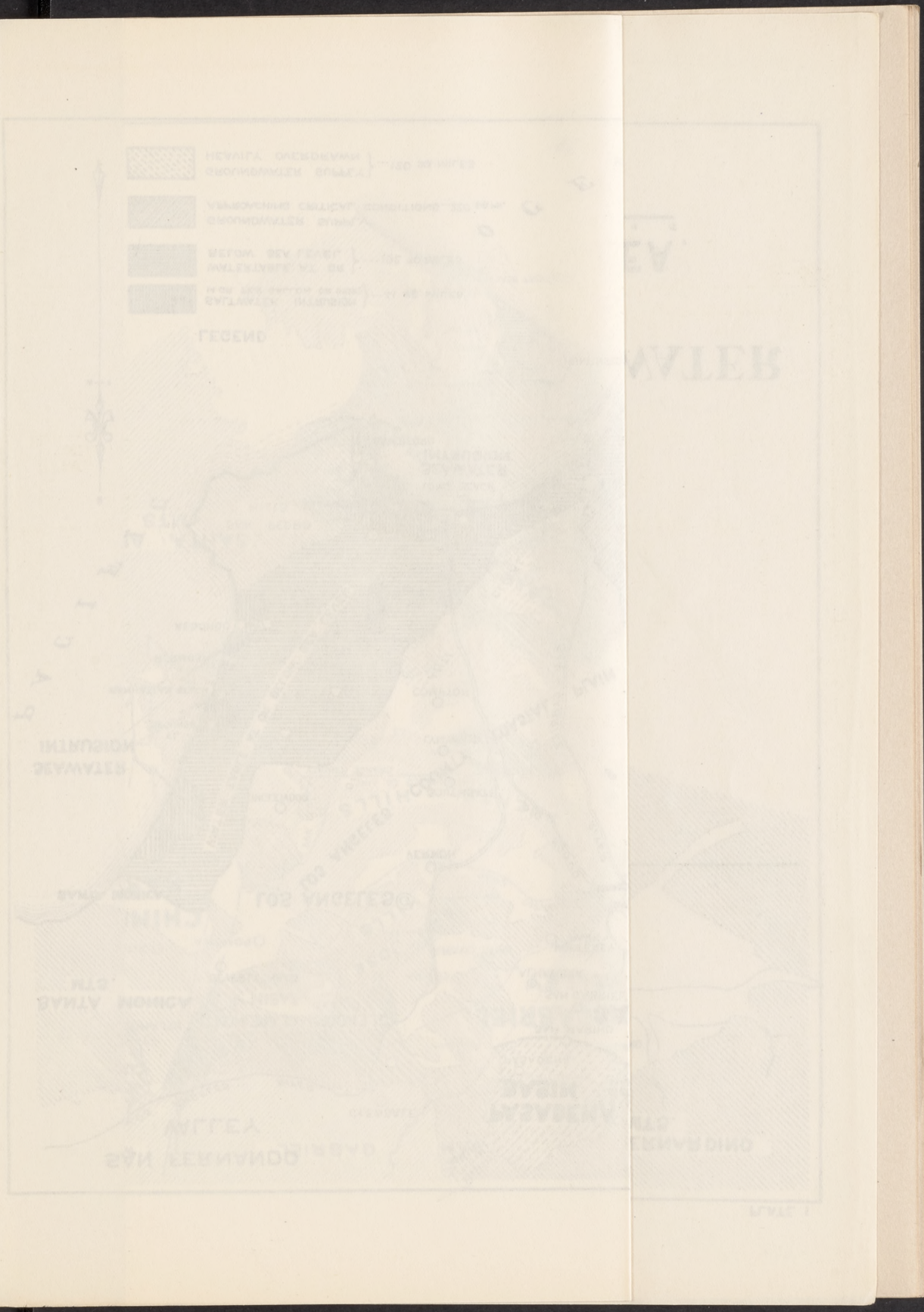


PLATE 2



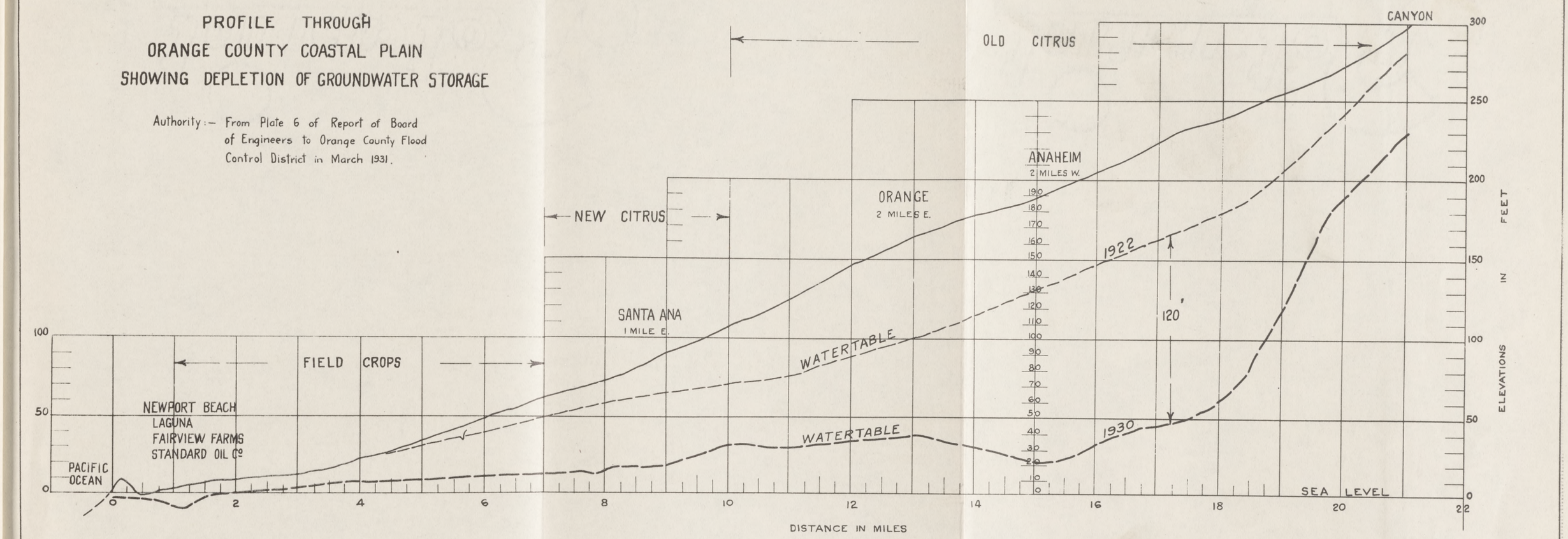
A. L. Sonderegger

G-460



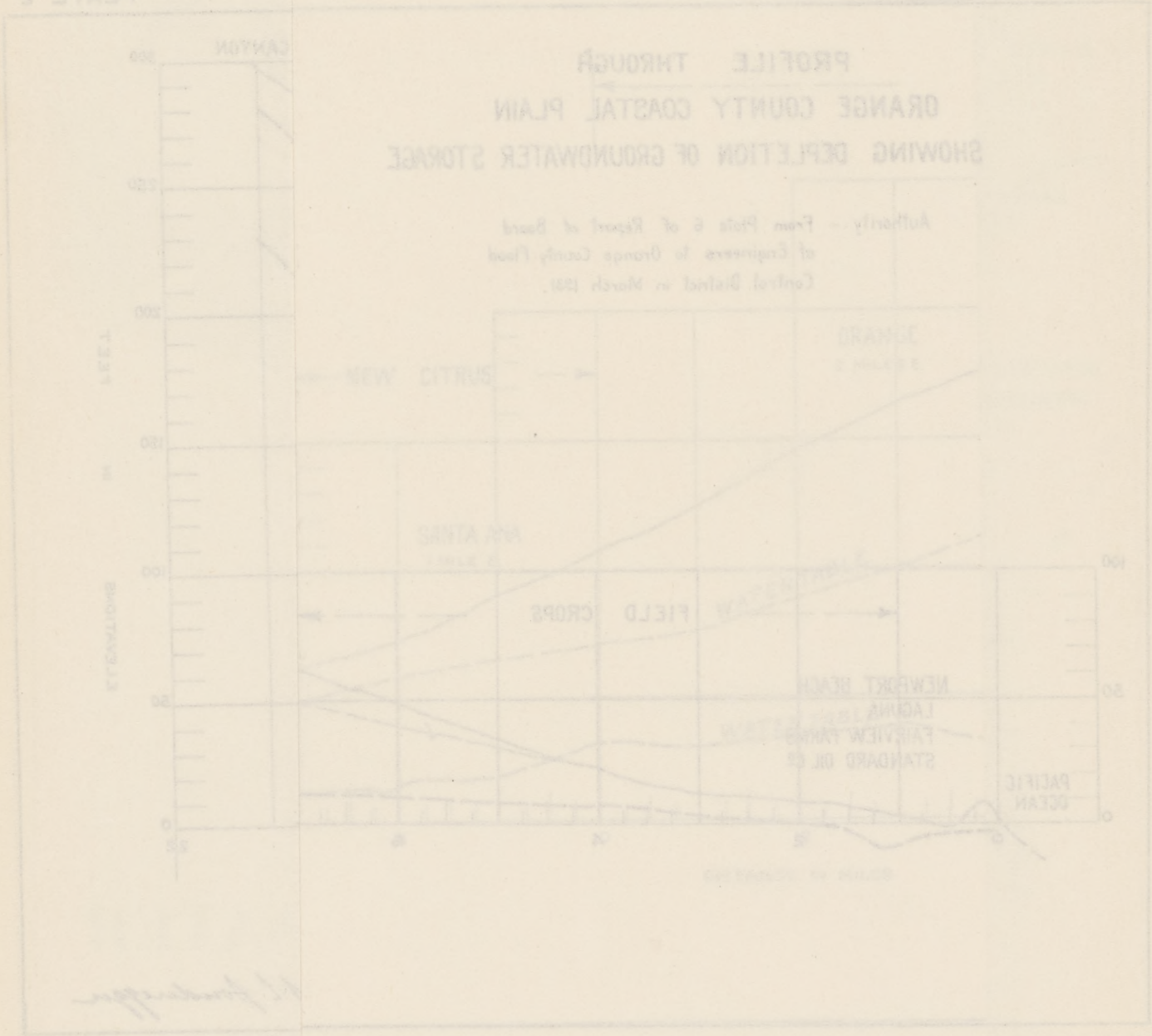
PROFILE THROUGH ORANGE COUNTY COASTAL PLAIN SHOWING DEPLETION OF GROUNDWATER STORAGE

Authority:— From Plate 6 of Report of Board of Engineers to Orange County Flood Control District in March 1931.



A. L. Sonderegger

G-460



Letter from

F. E. Weymouth, Chief Engineer

to

W. P. Whitsett

Chairman, Board of Directors

in regard to the

PUMPED STORAGE AQUEDUCT PROJECT

Proposed by

Mr. Ralph Bennett

WHT 7

Letter from

P. E. Weymouth, Chief Engineer

to

W. P. Whitsett

Chairman, Board of Directors

in regard to the

Proposed by

Mr. Ralph Bennett

May 4, 1931.

Letter from

F. E. Weymouth, Chief Engineer

to

W. P. Whitsett

Chairman, Board of Directors

in regard to the

PUMPED STORAGE AQUEDUCT PROJECT

Proposed by

Mr. Ralph Bennett

May 4, 1931.

Letter from

F. E. Weymouth, Chief Engineer

to

W. E. Whitsett

Chairman, Board of Directors

in regard to the

PUMPED STORAGE AQUEDUCT PROJECT

Proposed by

Mr. Ralph Bennett

May 4, 1931.

STATEMENT of W. P. WHITSETT

to

COMMITTEE of MUNICIPAL LEAGUE

May 6, 1931

Gentlemen:

Mr. Weymouth has transmitted to me, as Chairman of the Board of Directors of The Metropolitan Water District of Southern California, a report covering certain plans, to which we understand you have given some study.

The District appreciates the interest you are showing in the Metropolitan Aqueduct by devoting your time in such investigations as this one now under consideration. You are in effect traveling the road over which the Directors and Engineers of the District have come during the years that this project has been going ahead. Innumerable plans have been exhaustively studied and checked in arriving at the final selection of the Parker Route as the official route of the District.

However, it is gratifying to know that you are interested in knowing how this or any plan was considered and why it was rejected in the final analysis. A reasonable amount of energy and the expenditure of a certain amount of money in making detailed information available for presentation to large, responsible and constructive groups of citizens

STATEMENT of W. P. WHITSETT

to

COMMITTEE of MUNICIPAL LEAGUE

May 6, 1931

Gentlemen:

Mr. Weymouth has transmitted to me, as Chairman of the Board of Directors of The Metropolitan Water District of Southern California, a report covering certain plans, to which we understand you have given some study.

The District appreciates the interest you are showing in the Metropolitan Aqueduct by devoting your time in such investigations as this one now under consideration. You are in effect traveling the road over which the Directors and Engineers of the District have come during the years that this project has been going ahead. Innumerable plans have been exhaustively studied and checked in arriving at the final selection of the Parker Route as the official route of the District.

However, it is gratifying to know that you are interested in knowing how this or any plan was considered and why it was rejected in the final analysis. A reasonable amount of energy and the expenditure of a certain amount of money in making detailed information available for presentation to large, responsible and constructive groups of citizens

is deemed warranted.

Though the Parker Route has been officially chosen by the Directors on the basis of the ample and thorough reports and advices of our engineers and consultants, we take pleasure in discussing at your request these particular plans and schemes. Mr. Weymouth has deemed it reasonable that the District should make a deviation from its intensive activities to consider these matters for your information, that you may be satisfied not only that the best and safest route has been chosen, but also that you may learn from actual contact the able, thorough, and efficient manner in which the work of the District is being conducted.

- -- -

is deemed warranted.

Though the Parker Route has been officially chosen by the Directors on the basis of the ample and thorough reports and advices of our engineers and consultants, we take pleasure in discussing at your request these particular plans and schemes. Mr. Weymouth has deemed it reasonable that the District should make a deviation from its intensive activities to consider these matters for your information, that you may be satisfied not only that the best and safest route has been chosen, but also that you may learn from actual contact the able, thorough, and efficient manner in which the work of the District is being conducted.

Mr. W. P. Whitsett, Chairman
The Metropolitan Water District
of Southern California,
Los Angeles, California.

Dear Mr. Whitsett:

In the February 15, 1931 issue of the monthly bulletin of the Municipal League of Los Angeles, there appeared an article by Ralph Bennett, consulting engineer of this city, proposing a route for the Metropolitan Water District aqueduct differing in a number of respects from the Parker route and, in fact, from all routes described in published engineering reports of the District. Since the publication of this article, Mr. Bennett has prepared other papers and the League has taken considerable interest in the subject. They have requested that the Bennett scheme be investigated. To make a thorough field investigation of such a line would require an expenditure of at least $175,000 and would consume considerable time. However, lines of a similar nature through the region favored by Bennett were investigated in 1929 and preliminary estimates based upon existing maps and a careful field reconnaissance have been recently made which conform to his scheme as understood by

Mr. W. P. Whitsett, Chairman
The Metropolitan Water District
of Southern California,
Los Angeles, California.

Dear Mr. Whitsett:

In the February 15, 1931 issue of the monthly bulletin of the Municipal League of Los Angeles, there appeared an article by Ralph Bennett, consulting engineer of this city, proposing a route for the Metropolitan Water District aqueduct differing in a number of respects from the Parker route and, in fact, from all routes described in published engineering reports of the District. Since the publication of this article, Mr. Bennett has prepared other papers and the League has taken considerable interest in the subject. They have requested that the Bennett scheme be investigated. To make a thorough field investigation of such a line would require an expenditure of at least $175,000 and would consume considerable time. However, lines of similar nature through the region favored by Bennett were investigated in 1928 and preliminary estimates based upon existing maps and a careful field reconnaissance have been recently made which conform to his scheme as understood by

this office.

The Bennett plan is found to be without merit. However, the Municipal League has asked for a report on the subject and because of their evident sincerity of purpose, and because of the high standing of the League and its individual members in the community, it is thought that they are entitled to the available facts in detail. The purpose of this communication is to inform you fully of the situation so that you may take whatever action you deem appropriate.

Bennett's Plan

As understood in this office, Mr. Bennett's plan embraces the following fundamental factors:

1. He believes that a great saving in capital cost can be had by diverting from the end of the All-American canal, rather than by building a separate aqueduct all the way from the Colorado River.

2. He believes that an All-American line via the southwestern corner of Imperial Valley, and crossing the mountains in northern San Diego County, is superior to the All-American-Picacho line estimated by the District.

3. He considers co-operative transportation through about 90 miles of Imperial Valley irrigation canals an acceptable means for delivering domestic water to the Metropolitan Water District.

4. He claims that the endeavor of the District to secure a line with a minimum pump lift is fundamentally wrong and advocates much higher lifts, with regeneration of electrical energy at the resulting power drops. By generating such energy at times of peak demand, he believes its value can be enhanced to such an extent as to yield an appreciable profit.

5. He believes that only a small flow will be needed at first and that some line through northern San Diego County is more suited to partial development than the lines proposed by the District.

6. He believes the distribution system can be greatly reduced in cost and simplified by a universal exchange of water rights.

Previous All-American Studies

Many alternative estimates have been prepared for lines taking water from the end of the All-American canal. The best of these lines, known as the All-American-Picacho route, is discussed in detail in the November, 1930, report. It was not possible in that report to include all of the hundreds of routes previously studied and discarded. Among such discarded routes were two following in general the route which it is thought is advocated by Mr. Bennett. These routes are shown on the attached photographic map, Exhibit 1, being marked "P" and "R". For both of these routes the proposed

All-American canal was assumed to be used from the Laguna dam to a point near the international boundary, ten miles west of Calexico, a distance of about 82 miles.

From the end of the proposed All-American canal, the "P" line continues in a northwesterly direction along the west side of Salton Sea to a point near Fish Springs. Here the water is passed through clarifiers and then pumped to the intake of a tunnel through the south end of Santa Rosa Mountains. Emerging from the tunnel the location passes to the east of Borego Valley. Near the upper end of the valley a second pump lift raises the water to a tunnel 45 miles long extending west to Temecula Valley, with outlet portal at elevation 1100.

For the "R" line the flow is passed through clarifiers located at the end of the All-American canal, and is then pumped to a height of 110 feet through a long force main. The location then follows in a northwesterly direction along the west side of Imperial Valley to the foot of the Vallecitos Mountains. Here a second pump lift raises the water to sufficient height to pass through the northern point of Mesa Grande by a tunnel $2\frac{1}{2}$ miles in length. Four miles beyond the end of this tunnel pump lift No. 3 elevates the water to sufficient height to enter the Borego Valley. The line then extends along the west edge of this valley to a point 4 miles north of Palm Canyon where the fourth and last pump lift is located.

From the top of this pump lift a 41-mile tunnel extends in a northwesterly direction to Temecula Valley. The elevation at the outlet portal is 1200 ft.

For both of these lines storage is provided in Temecula Valley by a dam in Temecula Canyon about 1½ miles south of the town of Temecula. Water would be drawn out of this reservoir through a 31-mile tunnel passing to the south and west of Lake Elsinore. This tunnel would come to the surface in Temescal Valley about 8 miles southeast of Corona.

It will be noted from the description of the two lines that long tunnels are required. These tunnels call for deep shafts. Both lines cross the active Elsinore and San Jacinto faults in tunnel far beneath the surface. The tunnels also cut other faults which may be active. From Temecula reservoir to the tunnel portal about 8 miles southeast of Corona, the tunnel is parallel with and very close to the Elsinore fault. This fault also passes through the Temecula basin; a branch fault passing near the dam site.

The total pumping lift on either the "P" or "R" line would be over 1400 feet. Transmission lines from Boulder Canyon would be very long. Up to Temecula reservoir there would be no head available for generation of power on the "P" line. The drop from the "R" line to high water in the reservoir would be 100 ft. The hydraulic grade at the tunnel outlet 8 miles from Corona would be about elevation 970. This would allow some head for generation of power in the feeder system

From the top of this pump lift a 41-mile tunnel extends in a northwesterly direction to Temescula Valley. The elevation at the outlet portal is 1200 ft.

For both of these lines storage is provided in Temescula Valley by a dam in Temescula Canyon about 1⅝ miles south of the town of Temescula. Water would be drawn out of this reservoir through a 31-mile tunnel passing to the south and west of Lake Elsinore. This tunnel would come to the surface in Temescal Valley about 8 miles southeast of Corona.

It will be noted from the description of the two lines that long tunnels are required. These tunnels call for deep shafts. Both lines cross the active Elsinore and San Jacinto faults in tunnel far beneath the surface. The tunnels also cut other faults which may be active. From Temescula reservoir to the tunnel portal about 8 miles southeast of Corona, the tunnel is parallel with and very close to the Elsinore fault. This fault also passes through the Temescula basin; a branch fault passing near the dam site.

The total pumping lift on either the "P" or "R" line would be over 1400 feet. Transmission lines from Boulder Canyon would be very long. Up to Temecula reservoir there would be no head available for generation of power on the "P" line. The drop from the "R" line to high water in the reservoir would be 100 ft. The hydraulic grade at the tunnel outlet 8 miles from Corona would be about elevation 970. This would allow some head for generation of power in the feeder system

for the lower cities in the District. Pumping would be required to serve several of the member cities.

The estimated cost for either of these lines is greater than for All-American canal routes extending along the east side of Imperial Valley. The "P" and "R" locations require greater pumping lifts than other All-American lines reaching the same terminal elevation. As previously stated on both of these routes active faults would be encountered at great depth on long tunnels. One long tunnel would run parallel with and close to faults classed as active. The terminal elevation is lower than for other more favored routes, without compensating advantages.

The estimated first cost and the costs of water delivered through these lines are greater than for other lines, including other possible All-American routes. Their construction is considered infeasible, if possible at all. The first cost might be reduced by increasing the height of pump lifts, but studies made show that this would increase the delivered cost of water. It thus appears that these lines have nothing to commend them and they have been abandoned.

Recent Studies of Bennett's Plan

The "P" and "R" routes, above described, did not include the "power regenerative" or pumped storage feature of the Bennett scheme. Data available for high lift lines

for the lower cities in the District. Pumping would be required to serve several of the member cities.

The estimated cost for either of these lines is greater than for All-American canal routes extending along the east side of Imperial Valley. The "P" and "R" locations require greater pumping lift than other All-American lines reaching the same terminal elevation. As previously stated on both of these routes active faults would be encountered at great depth on long tunnels. One long tunnel would run parallel with and close to faults classed as active. The terminal elevation is lower than for other more favored routes, without compensating advantages.

The estimated first cost and the costs of water delivered through these lines are greater than for other lines, including other possible All-American routes. Their construction is considered infeasible, if possible at all. The first cost might be reduced by increasing the height of pump lift, but studies made show that this would increase the delivered cost of water. It thus appears that these lines have nothing to commend them and they have been abandoned.

Recent Studies of Bennett's Plan

The "P" and "R" routes, above described, did not include the "power regenerative" or pumped storage feature of the Bennett scheme. Data available for high lift lines

on other routes indicate that such a plan is not feasible. Nevertheless, data in suitable form for making a direct answer to Bennett's claims not being available a preliminary study of his proposal, as understood in this office, has been undertaken. The committee of the Municipal League handling this matter has been asked to present a sketch showing just the plan advocated by Mr. Bennett. It is understood that they could not do this as Bennett claims there are numerous ways in which his idea can be carried out. The figures submitted are based upon what appears to be the best plan for the type of development advocated by Bennett.

Bennett apparently advocates a line using the southern branch of the All-American canal and crossing the mountains in the northern part of San Diego County at a high level. Study of available data indicates the most feasible route for such a line to be that shown on Exhibit 1 as No. 116. This line contemplates the use of the Henshaw reservoir with a maximum water surface of 2727 ft. as a main storage unit for the production of peak power in accordance with the suggested regenerative scheme. A smaller basin in Nigger Valley, and the proposed reservoir at Cajalco, provide space to receive the tail water. The portion of the line below Cajalco reservoir is not shown, since it is identical with the approved Parker route and need not be considered in the present comparison.

This route contemplates the use of the All-American

canal from a point five miles above Laguna dam to a point near the international boundary, ten miles west of Calexico. Here the water is passed through clarifiers and then pumped 87 ft. in lift No. 1, from elevation 20 ft. below sea level to 67 ft. above sea level. From the top of this lift the line passes in a northwesterly direction along the west side of Imperial Valley for a distance of 32 miles. For the first 5 miles the line passes through rough country in conduit and siphons and for the remaining 27 miles the line is in open lined canal, with low head concrete siphons about every 2.5 miles to provide for cross drainage.

Lift No. 2 raises the water 1335 ft. from elevation 38 to elevation 1373. From the top of this lift the line passes through the Fish Creek Mountains in tunnels having a total length of 7 miles. From here the line traverses the rough country on the north side of Vallecito Wash in alternate grade conduit and concrete siphons for 15 miles to the foot of lift No. 3, where it is raised 1527 ft. from elevation 1320 to elevation 2847. At this point the line passes through the Vallecitos Mountains in a series of short tunnels having a total length of 9 miles to Box Canyon. Here a 1-mile steel siphon carries the water to the portal of a 6-mile tunnel through the Oriflamme Mountains.

At the west end of this tunnel the line passes through a high head concrete siphon near the town of Banner, and then

penetrates the Volcan Mountains with a 14-mile tunnel, delivering the water into Lake Henshaw at elevation 2727. This tunnel has two shafts, 1445 and 1570 ft.

Leaving Lake Henshaw in a northwesterly direction the line passes under the Agua Tibia Mountains in a 17-mile tunnel having two shafts and one adit. The depths of these shafts are 1320 and 1340 ft., respectively. Both the Volcan Mountains and the Agua Tibia Mountains appear to be stable blocks of granite between two faults.

From the portal of the 17-mile tunnel, a power drop of 1136 ft. is made from elevation 2656 to elevation 1520. This will deliver water into the proposed Nigger Valley reservoir at high water elevation 1520 ft. From Lake Henshaw to Nigger Valley reservoir, capacities of 1605 sec. ft., 3210 sec. ft., and 4815 sec. ft. have been figured for estimates 114, 115, and 116, respectively. These capacities correspond to return power load factors of 100%, 50%, and 33%, respectively.

Leaving Nigger Valley reservoir at elevation 1495, the line passes into a 2.5-mile tunnel emerging into Long Valley. From here the line passes through Long Valley, Los Alamos Valley, French Valley, and Menifee Valley in grade conduit, broken only by two low head concrete siphons and one short tunnel. At a point 3 miles south of Perris the water passes through a 2-mile concrete siphon into a 9.3 mile tunnel which delivers the water into Cajalco reservoir at elevation 1405. This tunnel has one shaft, 425 ft. in depth.

The line from the Laguna dam to Cajalco is made up of 108.78 miles of canal including 82.6 miles through the All-American, 37.91 miles of covered surface conduit, 25.91 miles of tunnel without shafts, 37.10 miles of tunnels with shafts, and 12.33 miles of pipe lines of various kinds. The longest tunnel is 14.5 miles.

Available Storage Sites

At the present time the spillway at Lake Henshaw is at elevation 2727 ft., 123 ft. above the stream bed. The storage capacity is 203,000 acre feet. The drainage area is said to be 209 square miles and the mean annual runoff is estimated to be approximately 38,000 acre feet. Topographically, it is possible to raise the existing dam. However, a preliminary geological report, by Dr. F. L. Ransome, made subsequently to the completion of estimates on Line 116, reveals the fact that the Henshaw dam is constructed directly across an important branch of the live Elsinore fault. It is classed as not acceptable for District use at its present height and certainly should not be raised. Now that it is known that this site is not acceptable, it would be logical to abandon it and plan another possible high storage unit. However, data for no other reservoir in this vicinity are available and it is apparent from reconnaissance that there is no other basin which will result in a development costing less than the one proposed. For this reason, it is thought

permissible to submit, for your consideration, the data so far collected. A definite decision on the project can be reached without further field work.

The Nigger Valley dam site is likewise crossed by a fault, but one that is not believed to be active. Geologically, the site is classed as probably acceptable but further investigation is recommended. It is impossible to take out of this basin at or near river bed level without getting into serious location difficulties and expensive construction below. In the development proposed, a dam 170 ft. high is contemplated, with the diversion level 25 ft. below a high water level of 1520 ft. The proposed line from that point, comes through much smoother country than any possible line at a lower elevation. The useful storage, above the diversion level, is 30,000 acre ft.

It might be possible to carry this dam higher although data available, supplemented by careful reconnaissance, indicate that such a possibility is doubtful.

Alternative Lines

From the general appearance of contour maps available it might be thought that following more closely the old low level route "R" would be more feasible than Route 116. Accordingly, an estimate was made along the route numbered 126 on Exhibit 1. Field examination reveals that the stretch marked D-E on the map is rough and involves expensive construction so that on the

permissible to submit, for your consideration, the data so far collected. A definite decision on the project can be reached without further field work.

The Nigger Valley dam site is likewise crossed by a fault, but one that is not believed to be active. Geologically, the site is classed as probably acceptable but further investigation is recommended. It is impossible to take out of this basin at or near river bed level without getting into serious location difficulties and expensive construction below. In the development proposed, a dam 170 ft. high is contemplated, with the diversion level 25 ft. below a high water level of 1250 ft. The proposed line from that point comes through much smoother country than any possible line at a lower elevation. The useful storage above the diversion level is 30,000 acre ft. It might be possible to carry this dam higher although data available, supplemented by careful reconnaissance, indicate that such a possibility is doubtful.

Alternative Lines

From the general appearance of contour maps available it might be thought that following more closely the old low level route "B" would be more feasible than Route 116. Accordingly, an estimate was made along the route numbered 136 on Exhibit I. Field examination reveals that the stretch marked D-E on the map is rough and involves expensive construction so that on the

average it offers no advantage as to cost over Line 116. The latter line having been selected with particular reference to favorable geological conditions, is more desirable from many points of view. Therefore, Line 126 need not be further discussed. No other advantageous route through this general region, approximately fulfilling Bennett's requirements, could be found.

High level lines following the general locations of the "P" and "R" routes were investigated, from the point of view of Bennett's regenerative power scheme, but no suitable power sites were found.

Alternative Storage Possibilities

Bennett claims that San Diego County "teems with reservoir sites". This may be true, but as stated above there are no definite data available on any of these sites suitable for use in connection with his plan.

On the Sweetwater and Otay drainage south of Lake Henshaw there are several small summit basins where a small amount of storage could be secured. Even for a small volume of storage the dams would be relatively long and high. These basins are at from 3800 to 4900 ft. in elevation.

North of Lake Henshaw on Temecula Creek drainage there are also several basins lying from 2900 to 4200 ft. in elevation. The storage capacity of these would be small, and long high dams are required.

Storage in the small basins mentioned in the two preceding paragraphs would be very expensive. To provide sufficient capacity for power control it would be necessary to develop several sites, some distance apart and at different elevations. To connect them would require long tunnels. They are located from 125 to 175 miles from the center of the metropolitan area to be served. To reach the basins south of Lake Henshaw it would be necessary to cross underground the Lake Elsinore fault which has been classed as active.

There are several basins on the San Luis Rey, San Dieguito, Sweetwater and Otay Rivers at low elevation where storage might be secured. The storage would be costly. They are to one side of a line extending to the Metropolitan District, and to reach them would materially lengthen the aqueduct. Several faults classed as active would be cut by tunnels. In addition they are too low to be fully effective.

Storage in Temecula Valley has been previously mentioned. This basin is very flat and covers a large area. A dam some 175 ft. high above stream bed would have a crest length of probably 500 ft. Rights of way would be fairly expensive. In addition to the cultivated lands, the town of Temecula, improved highways, a railway, transmission and telephone lines are located below the flow line. Losses of water by evaporation from the large exposed area would be

heavy. This reservoir does not fit in with any aqueduct line of reasonable cost. The maximum water surface would be about elevation 1100. An aqueduct leading to or from the basin would require long tunnels passing through active faults.

Estimates and Unit Costs

Preliminary estimates have been prepared for the construction of all of the All-American lines discussed above and for numerous others, except that power studies were complete only for the lines which were otherwise most promising; namely, Route No. 116, for the high lift and for several low lift lines through San Gorgonio Pass. One of the latter, Route No. 80-B, is described in the November, 1930, report. All of these estimates are based upon the same considerations as to conduit sizes and unit costs as were used in estimates for the Parker line.

The costs of the first 41.2 miles of All-American canal and of the Coachella branch to Dos Palmas were secured from the U. S. Bureau of Reclamation. Estimates for the remaining canal along the Mexican border to the pumping station near Calexico were made by the District. The costs for such portions of the All-American Canal as are used in the various schemes are assumed to be proportioned between the Irrigation District and the Metropolitan Water District in accordance with the relative flow requirements. In the lines via Calexico

the canals are assumed to be unlined, the resulting loss of water being ignored. This is not considered permissible, but is assumed to satisfy Bennett, who believes such a plan acceptable.

Results of Estimates

As previously stated, estimates made for the purpose of this paper go only as far as the Cajalco reservoir, the junction point for all lines considered. The Parker route estimate has been revised to the same point for comparison. Comparative figures are shown in Table 1. The value of return power is based upon sale prices discussed in a subsequent paragraph. It will be noted that the power salable has a present value of from $37,000,000 to $67,000,000, depending on load factor at the return power plant. However, this is so overbalanced by the extra construction costs and power bills that the net economy is heavily in favor of the Parker line. The average cost of water during the construction period is considerable higher for the regenerative lines, notwithstanding the fact that in the estimate they are not charged with seepage losses in the All-American canal. The operating cost after the bonds are redeemed is nearly double on the high lift lines.

Reasons for Higher Costs of Henshaw Line

The reasons for the higher costs on the Lake Henshaw routes and other routes from the south branch of the

the canals are assumed to be unlined, the resulting loss of water being ignored. This is not considered permissible, but is assumed to satisfy Bennett, who believes such a plan acceptable.

Results of Estimates

As previously stated, estimates made for the purpose of this paper go only as far as the Cajalco reservoir, the junction point for all lines considered. The Parker route estimate has been revised to the same point for comparison. Comparative figures are shown in Table I. The value of return power is based upon sale prices discussed in a subsequent paragraph. It will be noted that the power salable has a present value of from $37,000,000 to $67,000,000, depending on load factor at the return power plant. However, this is so overbalanced by the extra construction costs and power bills that the net economy is heavily in favor of the Parker line. The average cost of water during the construction period is considerable higher for the regenerative lines, notwithstanding the fact that in the estimate they are not charged with seepage losses in the All-American canal. The operating cost after the bonds are redeemed is nearly double on the high lift lines.

Reasons for Higher Costs of Hensbaw Line

The reasons for the higher costs on the Lake Henshaw routes and other routes from the south branch of the

All-American canal are apparent. In the first place, the lift being nearly 3,000 ft. on the Lake Henshaw route, the power required for pumping is enormous. The total power requirements of the full capacity line amount to about 600,000 kw., or 4,900,000,000 kw-hr. per year. This is 11% in excess of the firm kilowatt-hour output at Hoover dam in 1938 and approximately equal to the entire output of the power plant, including all secondary power under the 1988 conditions as estimated by the Bureau of Reclamation. Since the entire output of the Hoover plant would be required there would be no possibility of offpeak pumping with the full capacity Henshaw line, in contra-distinction to the Parker route where several small reservoirs near the intake make the utilization of offpeak Boulder canyon power feasible. A provision for the use of such offpeak power by the District is a feature of the present power contract, secured against the position of certain other prospective users of Boulder Canyon power.

The average cost of power for this line at the Boulder Canyon plant will be approximately 1.9 mills per kw-hr. On years of low river flow with no secondary power at Boulder Canyon the District would have to go into the open market for power to make up the deficiency and the average cost would, no doubt, be increased at such times. Alternative possibilities would be for the District to maintain a standby plant or to use the Nigger Valley power for pumping on low years. The

latter plan would reduce the value of the Nigger Valley power. In the cost figures given in this paper the need for standby plants is ignored.

The Lake Henshaw lines require longer tunnels than the Parker line. A line via Calexico encounters rough going as soon as it leaves pump lift No. 2 and is in hilly, rough country all the way to the Santa Ana River. Transmission lines from Boulder Canyon are longer. Pumping plants must be duplicated and the cost of return power plants must be added.

Reduced Capacity Lines

The claim is made by Bennett that a part capacity delivery can be made over his line better than over any of the lines proposed by the District. No reason for such a claim is given by him and none is apparent. Examination of Exhibit 1 fails to disclose any portion of his line which is more susceptible to partial development than other proposed routes, excepting possibly the unlined All-American canal, over the construction of which the Metropolitan Water District will have no control. If he proposes to build his line of parallel small pipes partial development would be possible as it would also on any other route, but the ultimate cost would be out of all reason. Estimates have been prepared for half capacity lines from the point of diversion to Cajalco reservoir and the results are shown in Table 2. It will be noted that the construction costs and operating costs for the Lake Henshaw

latter plan would reduce the value of the Mitger Valley power. In the cost figures given in this paper the need for standby plants is ignored.

The Lake Hemshaw lines require longer tunnels than the Parker line. A line via Calexico encounters rough going as soon as it leaves pump lift No. 2 and is in hilly, rough country all the way to the Santa Ana River. Transmission lines from Boulder Canyon are longer. Pumping plants must be duplicated and the cost of return power plants must be added.

Reduced Capacity Lines

The claim is made by Bennett that a part capacity delivery can be made over his line better than over any of the lines proposed by the District. No reason for such a claim is given by him and none is apparent. Examination of Exhibit I fails to disclose any portion of his line which is more susceptible to partial development than other proposed routes, excepting possibly the united All-American canal, over the construction of which the Metropolitan Water District will have no control. If he proposes to build his line of parallel small pipes partial development would be possible as it would also on any other route, but the ultimate cost would be out of all reason. Estimates have been prepared for half capacity lines from the point of diversion to Calexico reservoir and the results are shown in Table 2. It will be noted that the construction costs and operating costs for the Lake Hemshaw

routes are appreciably higher than for the Parker route and that the cost of water delivered to the District will be higher at all times.

The foregoing paragraph relates only to the comparative merits of the Lake Henshaw and Parker lines for partial developments. In order to dispose of one subject at a time the merits of partial development as against full initial construction on the main portions of the Parker line will be discussed in a subsequent paragraph.

Conclusions as to Comparative Estimates

The discussion thus far is believed to show that there is no merit to an All-American-Calexico-San Diego County route, so far as first cost or cost of water delivered to the Cajalco reservoir is concerned, granting the accuracy of the estimated income from return power, which will be discussed separately.

Merits of the Coachella Branch All-American Route

In one of his communications, Bennett analyzes the data given in the November 1930 report for an All-American route via the Coachella branch, and by eliminating certain features, shows that such a line can be constructed more cheaply than the Parker route. As fully brought out in the November report, this line as estimated is inferior to the Parker line in reliability, and in many other respects.

Bennett eliminates the storage at the end of the All-American canal, the lining of the canal, and other important features. He proposes to recover the seeped water by pumping, but adds nothing for the cost of installing or operating the recovering machinery. He does not suggest corresponding cheapening on the Parker route. His comparisons are not on a basis of equality.

It is shown in the November report that ignoring all the undesirable features involved water can probably be delivered into the District through an All-American-Coachella connection at slightly less cost than through the Parker line. The use of this line was not recommended at that time because of certain very definite reasons.

It is perfectly right and proper for example, for a grocery clerk of limited means to go to the junk yard and buy an almost worn out automobile to take his family out riding occasionally. Any day the car won't run he can stay home and work on it, and no particular harm is done. He might even go partners with a neighbor in the purchase of a second hand Ford. However, when he becomes owner of the store he can't afford to use the same policy in regard to his delivery wagon. His business will then depend on his delivery service, and his equipment must be dependable.

The Metropolitan Water District is not building the Colorado River aqueduct as a pastime. The water to be derived

from this project is to be the backbone of the future prosperity of Southern California. After this water carrier is put into operation it must be dependable 100% of the time. To have it involved in frequent controversies over operating problems, or in litigation over deliveries, cost of repairs or betterment, or to have its dependability disturbed or questioned would cast a shadow on all of our development. There must be no suspicion of doubt as to the dependability of this project.

The District has only the friendliest feeling toward the Imperial Irrigation District, and other prospective participants in the All-American canal development. I am personally on record as favoring the construction of this canal for irrigation purposes. However, the needs of the irrigation project as regards reliability of service, constancy of flow, sanitation, and other items, differ widely from those of the District. There would be an unavoidable conflict of interests on these features. The Irrigation District could not afford to maintain or operate its portion of the works on the basis of dependability required for a domestic supply. This would throw an excessive burden of expense on the Metropolitan Water District. To attempt any such cooperative work would be to invite trouble to an extent not justified by the small saving in cost possible when the lines are estimated on a reasonable comparable basis.

The intimation is made by Bennett that the District desires a separate intake, so that it may "grab" all the water it needs. This is absurd. The District has entered into a definite contract as to its water rights, and is limiting its conduits to the flow to which it is entitled. To divert more water would be impossible. Furthermore, there is no intention to have a separate intake. Negotiations for cooperative use of the Parker diversion dam are under way, and are expected to ultimately materialize.

Economics of "Regenerated Power"

Bennett makes the startling claim that the endeavor of the District to cross the divide between the Colorado River basin and the coastal plain at the lowest practicable elevation is basically wrong. He claims the crossing should rather be made at the highest practical level, with a storage basin at the summit and a large return power installation on the coastal slope. His idea is that by these means the District can take a large block of cheap power from Boulder Canyon, use it to pump water into a high level reservoir, from which it may be withdrawn as desired, thus making it possible to deliver large quantities of return power at times of peak demand. He believes such power can be sold for a price sufficiently high to yield a substantial profit over the price paid at Boulder Canyon, even after allowing for transmission and mechanical conversion losses, amounting to perhaps 50% of the power purchased for

pumping, over and above that which would be required without the regenerative scheme. In other words, he recommends that the District go into what is generally designated as the "pumped storage" power business on a large scale and suggests that this can best be accomplished by means of a line similar to the All-American-Lake Henshaw line previously discussed.

As a matter of fact, the Boulder Canyon power development and the Metropolitan Water District aqueduct, in combination, do not offer a favorable opportunity, under present day conditions, for a pumped storage power scheme. Furthermore, were such a project advisable, it could be accomplished much more advantageously than by the plan suggested by Bennett.

A pumped storage project is most applicable to a situation where there exists an uncontrolled flow of power which does not fit the demand, so that at certain times there is a deficiency and at other times potential power must be permitted to go to waste. Such a case might exist for a hydro plant on an unregulated river. In such event, the flow which would otherwise go to waste might be profitably utilized to pump water from the river into a high level storage reservoir and to pass it back to the river through turbines at times of deficient power supply. Such a plan involves losses in pumping, in the regeneration process, and in other miscellaneous ways.

Under exceptional circumstances, approximately 60% of the power used for pumping may be recovered and because such power would normally have been wasted the operation may be profitable, provided the cost of pumping equipment, storage, and generating equipment, is not excessive. Evidently, if possible to do so, it would be much simpler and more effective to provide the storage on the main stream in the first place, thus avoiding the expense and the power losses incident to the pumped storage development. There are other special cases where pumped storage may be feasible, sometimes even in connection with steam generation, but how it could ever be profitable to develop such a scheme in connection with the ample storage capacity of the Boulder Canyon reservoir is not apparent.

Cost of "Regenerated Power", Lake Henshaw Line

The problem can be illustrated effectively by quoting figures for the cost of return power on the Lake Henshaw route, which is thought to correspond approximately to Bennett's idea. In the first place, this line under full load with a total pump lift of approximately 3,000 ft. requires power equivalent to a continuous flow of 600,000 kw., or 4,900,000,000 kw-hr. per year, as previously mentioned. There is a possible drop of approximately 1200 ft. between Lake Henshaw and Nigger Valley which will deliver to the load center the equivalent of a continuous output of 97,000 kw., or 846,000,000 kw-hr. per year.

This is a little more than 1/5 of the input into the project as a whole. There will be an additional amount of return power available at Cajalco and within the distribution system but this is balanced by the same possibilities on the Parker line. Even if a different terminal routing were used for the Bennett line all net return power in excess of that at Nigger Valley would be balanced by possible developments on the terminal from Cajalco.

It would be unfair to charge the cost of all power for pumping on Bennett's line against his regenerated power, but since the lift is deliberately increased for the sole purpose of creating power head, it is clear that the cost of pumping through the height otherwise unnecessary should be charged to power. It would not be illogical to charge the Nigger Valley plant with the excess of the total power requirement over that for the Parker line. In the following figures the power development is charged only with the cost of pumping through a height equal to the power drop. This assumption is certainly not unfair to the project. On this basis this plant will be charged with 40% of the cost of pumping, the power drop being approximately that percentage of the total lift.

If the regenerated power is to be supplied on peak demand to enhance its value, as proposed, the aqueduct must be made oversize between the two controlling reservoirs. The extra cost of this work, over the cost for minimum development should be charged to power.

It will also be necessary to provide storage both above and below the power plant for regulation of flow. The high level storage must likewise be sufficient in volume to protect the power development against interruption of supply. For a line diverting from the All-American canal, a capacity of 300,000 acre feet would be a reasonable minimum amount. If such storage is not provided, the return power will not be firm, and its value will be reduced. Although such storage would be at a considerable distance from the point where the water is to be used it might, nevertheless, be considered as a part of the terminal storage system. It would not be fully effective for such purpose, as some storage closer to the point of use would be essential.

There is the further fact that no such volume of summit storage is known to exist at a point convenient for use. For the purpose of this paper, and to be more fair to the Bennett scheme, it will be assumed that such storage can be found and that all of it except 100,000 acre feet in Lake Henshaw and the 30,000 acre feet in Nigger Valley can be counted as terminal storage. The Nigger Valley space is all needed for regulation and is thus not available for emergency use.

The storage requirements for the low load factor estimates really should be increased, but data for doing this accurately are not available and the matter is not of great

importance at this time. The scheme is not feasible in any event, as is subsequently shown.

The full capacity of Lake Henshaw is 203,000 acre feet. In the absence of negotiations it is assumed that space in it can be purchased for $40 per acre foot. The cost of the Nigger Valley reservoir has been roughly estimated at $7,500,000, making the total charge of $11,500,000 against power for storage. This charge could be increased or decreased by 100% without materially affecting the conclusions reached in this paper.

The cost of the entire development and the value of the resulting power, depends vitally upon the load factor of the Nigger Valley plant.

The term "peak power" is an indefinite designation of power used when the system load is heavy as contrasted with power used during the light load hours. Every power system or power market has its own particular shape of load curve, and the time and duration of the peaks and valleys vary according to the industries served and the habits of the community. The Los Angeles city load has a sharp peak and a load factor below 50%. The Southern California Edison Company has two long daily peaks and a load factor above 60%. The shape of the curve and the maximum or peak load varies from day to day following more or less regular weekly and annual cycles.

The load factors named in the preceding paragraph apply to the total load, including valleys as well as peaks

and constitute the basic load from which average selling prices are computed. Machinery for delivering the extra power required during the rush hours is idle most of the time, and may operate at a disadvantage. A portion of the capacity of any plant may be required to operate only a few minutes each day, or even each year. The average cost of power would be less if the output were uniform. This gives peak power an excess value. But only such power as is sold at the time of maximum demand has this extra value. A peak plant, to be most effective, must operate only a portion of the time, and its output during that time will not be steady. It's installed capacity should perhaps be four times its average output or more. This results in a high investment charge in proportion to the power sold, and accounts for the added value of peak power. It is worth more because it costs more.

In our estimates for the Lake Henshaw line installations at the Nigger Valley plant, one, two and three times the average output are assumed, corresponding to load factors of 100%, 50%, and 33%. The 100% development is for direct comparison with the Parker line, without regard to the merits of the pumped storage plan. The 50% factor is thought to be the maximum which would have any particular advantage over average load conditions. A factor of 33% would result in a somewhat greater value for power sold, and is about the limit of production, with the project as planned. These are annual, not daily, load factors. With the Bennett project as planned, it

daily, load factors. With the Bennett project as planned, it
question, with the project as planned. These are annual, not
greater value for power sold, and is about the limit of pro-
load conditions. A factor of 33% would result in a somewhat
imum which would have any particular advantage over average
pumped storage plan. The 50% factor is thought to be the max-
ison with the Parker line, without regard to the merits of the
100%, 50%, and 33%. The 100% development is for direct compar-
average output are assumed, corresponding to load factors of
tions at the Wager Valley plant, one, two and three times the
In our estimates for the Lake Hensaw line installa-

value of peak power. It is worth more because it costs more,
in proportion to the power sold, and accounts for the added
the time, and its output during that time will not be steady.
age output or more. This results in a high investment charge
It's installed capacity should perhaps be four times its aver-
plant, to be most effective, must operate only a portion of
at the time of maximum demand has this extra value. A peak
peak power an excess value. But only such power as is sold
power would be less if the output were uniform. This gives
minutes each day, or even each year. The average cost of
capacity of any plant may be required to operate only a few
time, and may operate at a disadvantage. A portion of the
power required during the rush hours is idle most of the
prices are computed. Machinery for delivering the extra
and constitute the basic load from which average selling

is doubtful if a lower load factor would offer any financial improvement. Certainly no such factor would make the scheme feasible, as will appear from the cost figures.

On the basis of the above assumption, the cost of the Nigger Valley development is estimated as follows:

	33% Load Factor	50% Load Factor	100% Load Factor
Storage	$11,500,000	$11,500,000	$11,500,000
Aqueduct enlargement	17,117,000	10,432,000	-
Transmission lines	10,200,000	6,900,000	4,990,000
Power plant	12,462,000	9,437,000	5,337,000
Sub-total	$51,279,000	$38,269,000	$21,827,000
40% of Pumping System	32,000,000	32,000,000	32,000,000
Total	$83,279,000	$70,269,000	$53,827,000
Capital cost per kw. delivered	$ 288	$ 366	$ 556

The annual charges for pumping on the Henshaw line are:

Amortization on 50-year 4-3/4% sinking fund basis	$4,300,000
Operation and maintenance	818,000
Power	9,143,000
	$14,261,000

Forty per cent, or $5,700,000 of this amount, is considered as chargeable against the production of return power.

The resulting annual cost of return power delivered to a substation near Rialto would be as follows:

	33% Load Factor	50% Load Factor	100% Load Factor
Return power system	$3,081,000	$ 2,279,000	$ 1,202,000
40% of pumping	5,700,000	5,700,000	5,700,000
Total	$8,781,000	$ 7,979,000	$ 6,902,000
Unit cost per kw-hr.	10.4 mills	9.5 mills	8.2 mills

Value of Return Power

It will be seen from the foregoing figures that Nigger Valley power delivered into the District, costs a great deal more than the price paid for energy at Boulder Canyon. Its production would therefore be beneficial only in the event that peak power developed by other means were more expensive. It is also necessary to know whether the market can absorb the contemplated output of peak power. It is probable that 846,000,000 kw-hr. per year of 33% power could be sold by the time that it would become available, especially since with the Bennett scheme all other Boulder Canyon power would be eliminated. No attempt will be made to establish this as a fact since the plan is infeasible regardless of market conditions.

The value of steam power was given considerable attention in fixing the value of Hoover dam power, and the

estimates of the Bureau of Reclamation, City of Los Angeles, and the Southern California Edison Company, were in fair agreement. Based on these studies and assuming a fuel cost equivalent to 50¢ per bbl. of oil, the cost of power at a steam plant located at the coast is approximately as follows:

100% load factor 2.5 mills per kw-hr.
50% load factor 3.8 mills per kw-hr.
33% load factor 5.4 mills per kw-hr.

It would probably be necessary to discount these steam plant costs somewhat in arriving at a price for Nigger Valley return power, but for the present approximate purpose such discount will be ignored.

Another source of peak power is its direct transmission from Boulder Canyon. Such transmission would require extra equipment at Boulder Canyon and extra transmission lines. The estimated costs of Boulder Canyon power delivered to the metropolitan area, for 33%, 50% and 100% load factor are, respectively, 5.4, 4.1 and 3.4 mills per kw-hr.

The estimated cost of power from local steam plants, Boulder Canyon and Nigger Valley, on various load factors, may be summarized as follows:

Estimated Cost of Power Delivered to
Metropolitan Area - Mills per Kw-hr.

	33% L.F.	50% L.F.	100% L.F.
Steam Plant	5.4	3.8	2.5
Boulder Canyon	5.4	4.1	3.4
Nigger Valley	10.4	9.5	8.2

These figures show that Nigger Valley power costs about twice as much as Boulder Canyon power, on any load factor, and from two to three times as much as local steam power under present day conditions.

Reasonableness of the Costs Shown

The cost figures shown above are in no way surprising. The generation of power at Boulder Canyon in accordance with daily or annual peak demands is a simple matter. A great volume of storage space is available, and the provision of additional generating equipment, once the plant and dam are built, is easy. The additional expense of transmission is the only important objection to a low load factor.

The only objection to a steam plant for peak loads is the cost of extra equipment and the cost of keeping spare units hot. The cost of installation for steam plants is less than for the Nigger Valley plant, and the standby charges are

Estimated Cost of Power Delivered to
Metropolitan Area - Mills per Kw-hr.

	23% L.F.	50% L.F.	100% L.F.
Steam Plant	5.4	3.8	2.5
Boulder Canyon	5.4	4.1	3.4
Nigger Valley	10.3	9.5	8.7

These figures show that Nigger Valley power costs about twice as much as Boulder Canyon power, on any load factor, and from two to three times as much as local steam power under present day conditions.

Reasonableness of the Costs Shown

The cost figures shown above are in no way questioning. The generation of power at Boulder Canyon in accordance with daily or annual peak demands is a simple matter. A great volume of storage space is available, and the provision of additional generating equipment, once the plant and dam are built, is easy. The additional expense of transmission is the only important objection to a low load factor.

The only objection to a steam plant for peak loads is the cost of extra equipment and the cost of keeping spare units hot. The cost of installation for steam plants is less than for the Nigger Valley plant, and the standby charges are

not excessive for gas or liquid fuel.

The Bennett scheme requires the duplication of a portion of the Boulder Canyon storage space in a high mountain reservoir, also the duplication of power houses, and the building of long penstocks and pump delivery lines. It requires the building and operating of pumping plants, to lift the water up, so that it may be allowed to fall down again. The particular scheme advocated by him requires the construction of the aqueduct in a poor and expensive location. Because all the Boulder Canyon power is required for pumping, it permits a reduction in the power equipment at Boulder Canyon and the transmission line to the pumping plant may be operated on 100% load factor. The main transmission lines would be equally long, if not longer, than to Los Angeles, and in addition, moderately long low load factor lines would be required from Nigger Valley to the market. The District's investment in transmission lines would be greatly increased, but other lines would be eliminated. As a whole, the cost of transmission might be reduced, but not enormously.

Other Disadvantages of the Bennett Scheme

In his published statement Bennett says that the Parker line will consume 300,000 kw. of power, and that if his scheme returns half that amount, or 150,000 kw., great benefit to the community will result. The simple statement, as made, sounds attractive, but it contains the fallacy that

600,000 kw. rather than 300,000 kw. are required to operate his line. This is the inevitable result of doubling the pump lift. Therefore, using his figures, to secure the return of 150,000 kw. over and above the power recoverable on the Parker route, requires the expenditure of an additional 300,000 kw., and thus represents a large net loss in power supply.

Using more exact figures, the total amount of energy at Boulder Canyon annually (1928 conditions) is 4,330,000,000 kw-hr. of firm power, or 5,880,000,000 kw-hr. total, including the secondary power. Of this power 2,174,000,000 kw-hr. will be required under the Parker plan, leaving 3,706,000,000 kw-hr. plus the return power at Cajalco, available for other purposes. Under the Henshaw plan 4,900,000,000 kw-hr. per year would be required for pumping, leaving less than 1,000,000,000 kw-hr. of secondary power available at Boulder Canyon for other purposes. This secondary power would not justify transmission costs to the power market, particularly since it gradually diminishes until none is available in 1988. The marketable power under the Henshaw plan, therefore, would be reduced to the output of the Nigger Valley plant, or 846,000,000 kw-hr. per year, 22% of the amount available under the Parker plan. The return power at Cajalco would be the same as the Parker route. Such a change in the plans would affect all parties interested in Boulder Canyon power. The City of Los Angeles and all the municipalities would be deprived of their present supply of

cheap power, as also would be the private corporations and the States of Nevada and Arizona. All existing power contracts would be scrapped and revision of the Boulder Canyon Act would be required to permit the allotment of all the power generated to the Metropolitan Water District. These conditions are not even remotely possible.

Another objection to the Bennett plan is that under anticipated future conditions the power required for pumping materially exceeds the total supply of firm power at Boulder Canyon. As a result, the District would need to maintain large standby plants to take care of this load in low water years, when there is no secondary power. As an alternative, the Nigger Valley power might be used for pumping, but such use would destroy its salability at fancy prices and would require that some other agency carry the standby investment. No standby plant cost is included in any estimate for lines shown in this paper.

Also, such a system would have the defect, once it is completed, of imposing a rigid operating program. All water delivered would need to be pumped over the high summit and the number of kilowatt-hours per year converted from cheap Boulder Canyon power to expensive Nigger Valley power would bear a fixed ratio to the water pumped, regardless of whether the demand for peak power bore such a ratio to the water demand. Also, the excess consumption of power could never be stopped, regardless of any future change in the

power situation. The time may come when the destruction of 2,860,000,000 kw-hr. per year for the sole purpose of changing 846,000,000 kw-hr. of the remaining supply into peak power by the District, when it could be otherwise transformed more efficiently, will not be permissible.

The proposed plan would force the District into the pumped storage power business immediately the aqueduct is put into operation, regardless of the fact that there will at that time be a surplus of installed generating capacity in the community. There would be no way to bring the water in except to pump it over the summit and pass it down through the regenerating plants. Should there be no demand for expensive peak power, this operation would be at a loss. The District could hardly afford to maintain its monoply on Boulder Canyon power in the early years for the purpose of holding the price for its Nigger Valley output up, but if not, temporary disposition of the surplus might be difficult.

Pumped Storage Possibilities on Other Lines

It can be proved that pumped storage for power, in connection with the Metropolitan Water District aqueduct, is infeasible under any present day circumstances, but if conditions were to change in any way, making such a development desirable at some time in the future, it could be accomplished much more effectively elsewhere than at the Nigger Valley

plant of the Lake Henshaw route. So far as power development alone is concerned, it makes no difference whether the flow is pumped up one side of a mountain and brought down the other, or whether it is pumped up and brought down through the same pipes. A pumped storage installation, superior in all respects to that proposed at Nigger Valley, is possible on the Parker route. This can be accomplished by the simple expedient of placing pumping and generating units between any two reservoirs having different levels and circulating stored water between them. Such an installation would be independent of the flow in the aqueduct, would be practically unlimited in size or capacity, could be installed at any future time needed, and its operation could be discontinued at any time it became unprofitable or undesirable. There are several reservoir combinations in the Perris Valley which might be utilized for such a plan. Such a system could be installed at the time the aqueduct is built or at any time in the future.

Also a high level reservoir is available in the Potrero Canyon which could perhaps be utilized for pumped storage, if desired, thus eliminating the San Jacinto tunnel, but such a plan is not considered economically justified.

For an equal peak delivery such a plan in connection with the Parker route would destroy less energy

than the Lake Henshaw route.

As a matter of fact, the advantages of pumped storage, if any, can be had without reference to the Metropolitan Water District aqueduct. There are, no doubt, desirable locations for such plants near the seashore or along the present aqueduct from Owens Valley. It is notable that neither the Bureau of Power and Light nor any of the local power companies have availed themselves of any of the existing facilities for such development.

Advisability of Partial Development

The relative merits of the Bennett line for partial development were discussed above, but the value of such development, after the question of route is settled, has not been considered. In this respect there are three alternative procedures, as follows:

1. The project may be constructed initially to full capacity in all its features, including distribution lines and terminal storage.

2. The features not readily divisible, such as main line tunnel and conduits may be built full-size, the pumping plants, pipe lines, storage reservoirs, distributing lines, being built to part capacity at first and enlarged or added to as required.

3. All features, including tunnels and concrete surface lines may be built in part.

Plan One would be expensive and is not thought to be justified.

Plan Two is more reasonable, and is favored by the District as figures show that it is ultimately more economical than Plan Three.

Plan Three is favored by Bennett because of his belief that it will effect a material saving.

Advisability of Partial Development

The relative merits of the Bennett line for partial development were discussed above, but the value of such development, after the question of route is settled, has not been considered. In this respect there are three alternative procedures, as follows:

1. The project may be constructed initially to full capacity in all its features, including distribution lines and terminal storage.

2. The features not readily divisible, such as main line tunnel and conduits may be built full-size, the pumping plants, pipe lines, storage reservoirs, distributing lines, being built to part capacity at first and enlarged or added to as required.

3. All features, including tunnels and concrete surface lines may be built in part.

Plan One would be expensive and is not thought to be justified.

Plan Two is more reasonable, and is favored by the District as figures show that it is ultimately more economical than Plan Three.

Plan Three is favored by Bennett because of his belief that it will effect a material saving.

Careful comparative estimates for Plan Two and Three have been made for the Parker and Lake Henshaw lines. The initial cost of a full-sized Parker line, from the river to Cajalco reservoir, with secondary features provided for half capacity at first, is estimated to be $156,852,000. The deferred features, when built will require an additional $12,600,000, making a total of $169,452,000. If the entire project is at first built half-size and later duplicated, the initial expenditure, to Cajalco, is estimated as $123,012,000, and duplication in the future will require an expenditure of $99,663,000, which brings the total up to $222,675,000. This is substantially greater than for full-sized main features. The relative economy of the two plans depends upon the time at which future development will be required. If a half capacity line will suffice for only a few years, the first plan is preferable, but if the second development can be deferred for a long time, the interest on the saving of $33,840,000 in first cost will offset the excess of $53,223,000 in ultimate cost.

The effect of the time at which the second development, in each of above cases, will be required is shown in the accompanying tabulation, Table 3, and also by the curves of Exhibit 2. If the water demand is to grow rapidly, so that the second half of the aqueduct will be needed in 10 to 15 years after the first development is put into operation

(that is up to somewhere around 1950) ultimate economy strongly favors full development of the main features in the first place. If the second development can be deferred as long as 21 years (that is until about 1960) then there is no choice between the two plans on the basis of financial theory with money worth $4\frac{3}{4}\%$. With cheaper money the time of theoretical equality would be further deferred.

According to our predictions of water demands, a half-sized line will be sufficient for only a few years after the beginning of operation, unless we deliberately limit the flow for irrigation purposes. The District's studies have been recently supplemented by a comprehensive report on water requirements made for the Board of Directors by Mr. A. L. Sonderegger. Mr. Sonderegger's estimate of future needs is more conservative than our own but, nevertheless, he finds that half the flow will be absorbed by 1950, that is, 750 second feet additional diversion within the next 20 years. This will increase our present water resources, exclusive of rainfall, by about 50%. To provide for continued growth, under his estimate, the second development must be ready by 1950, which favors full-sized main features at first.

In addition to financial consideration, there are many other reasons for building the difficult part of the work full-size in the beginning. For one thing, the time to get a right to water is while it is still available. Theoretically, once a water right has been granted, it may make

no difference how the works for its utilization are constructed, so long as it can be shown that such development is proceeding diligently toward ultimate full utilization. But with a 1500 sec. ft. main aqueduct line already constructed it will be much easier to make a showing of due diligence than with a smaller line. A full-sized line would also give greater assurance of the ultimate completion of the project, and would add a note of confidence which would be beneficial to the community. In view of the relatively small additional cost, no particularly potent argument in favor of half-sized initial development is apparent, unless it is believed that a diversion of 750 sec. ft. is all that will ever be required, which is plainly absurd.

An additional financial factor, not shown in Table 3, or on Exhibit 2, is that economic balance and changed hydraulic conditions make it necessary for greatest economy, to use steeper slopes on the half-sized aqueduct. This results in an increase in the pumping charge, which will continue for all time, and would create an additional financial advantage in favor of the full-sized line. The operating charge, per acre foot of water, delivered into the Cajalco reservoir through a full-sized line, exclusive of interest and bond redemptions, for the aqueduct only, is estimated at $6.65. The same cost through a single half-size line is

$9.32. For an ultimate development of two parallel half-size lines this might be slightly reduced as to labor charge only. This factor has an important bearing on the development program.

Bennett's Suggestions on Distribution Systems

Mr. Bennett makes certain assumptions as to our distribution plans, which assumptions are incorrect, and offers certain advice on the subject. His plan seems to be to have the Colorado River water all delivered along the coast, at low elevation, the higher areas being supplied by water from other and higher sources. He seems to be of the opinion that large additional importations from the North may be expected at an early date, and that the foothill cities can be supplied from local sources until such high-level water arrives. He recommends universal exchange of water rights, presumably diverting Santa Ana River and San Gabriel River waters, now flowing to Riverside and other low-level cities, to the foothill areas, and Colorado River water being substituted therefor. He seems to have the idea that no consideration is being given by the District to low-level storage.

Mr. Bennett's ideas as to the District's distribution plans are erroneous, due, no doubt, to the fact that the November 1930 report does not cover the distribution works. The purpose of that report was the assembling of facts needed

in the selection of a main aqueduct route. Terminal storage facilities were considered only insofar as they affected that part of the problem. Return power was likewise limited. It was believed at that time, and is now believed, that the main terminal should preferably be at an elevation which will command the major portion of the District area. Only the power developed by the flow of water into the final terminal reservoir was discussed in the report, because only that part of the project was under consideration, as was clearly stated. There has never been any intention to ignore the power possibilities within the distribution system.

No fundamental exception is taken to Bennett's idea of universal exchange of water right. Negotiations looking towards such exchange are under way. However, the District is faced with a practicable problem rather than an idealistic theory. We must be in a position to deliver water to the cities which are willing to pay for it, and we must deliver it when it is needed, and not at some nebulous, future, Utopian time after the Sacramento is flowing into the valley, and after all of our legal differences of opinion have been dissolved into brotherly love. Existing local supplies, unfortunately, are not uniformly distributed along the foothills, but are largely concentrated in a few spots. Much of the conservation of flood flows is accomplished in the gravel beds of the lower areas. It is being found in certain cases,

to be cheaper to supply portions of the higher areas with Colorado River water than to attempt to concentrate and convey local water to them. The cheapest place to use water pumped from an underground basin is likely to be on the ground immediately above the basin.

In one of Bennett's communications, he suggests that his exchange idea will avoid useless duplication of mains and submains. The District's plans have no bearing on water mains or submains, the intention being to make wholesale deliveries to municipalities or water districts, leaving detail deliveries to the various local organizations. Every attempt is being made to plan a wholesale delivery system which will not upset any likely future development. All the factors mentioned by Bennett, and many others, are being carefully considered.

CONCLUSIONS AND RECOMMENDATIONS

1. A line diverting from Southern Branch of the All-American canal is inferior in all respects to the approved Parker route or the All-American-Coachella route, for either full or partial development. Such a line should receive no further consideration.

2. A line diverting from the end of the Coachella branch of the All-American canal will cost somewhat less to construct than the Parker line but the operation cost is

to be cheaper to supply portions of the higher areas with Colorado River water than to attempt to concentrate and convey local water to them. The cheapest place to use water pumped from an underground basin is likely to be on the ground immediately above the basin.

In one of Bonnett's communications, he suggests that his exchange idea will avoid useless duplication of mains and submains. The District's plans have no bearing on water mains or submains, the intention being to make wholesale deliveries to municipalities or water districts, leaving detail deliveries to the various local organizations. Every attempt is being made to plan a wholesale delivery system which will not upset any likely future development. All the factors mentioned by Bennett, and many others, are being carefully considered.

CONCLUSIONS AND RECOMMENDATIONS

1. A line diverting from Southern Branch of the All-American canal is inferior in all respects to the approved Parker route or the All-American-Cocopelia route, for either full or partial development. Such a line should receive no further consideration.

2. A line diverting from the end of the Cocopelia branch of the All-American canal will cost somewhat less to construct than the Parker line but the operation cost is

higher. Any possible saving is more than offset by operating disadvantages. This is true for either full or partial development. Such a line should receive no further consideration.

3. Bennett's high lift "regenerative" power plan is without merit. It should be given no further consideration.

4. Should the "regeneration" of peak power in connection with the operation of the aqueduct ever become desirable, which is unlikely, it can be accomplished more readily on a San Gorgonio Pass line than by Bennett's scheme. No such plan is advisable at the present time and no advance preparation is necessary. No further consideration should be given to such a plan at this time.

5. Consideration of ultimate economy points definitely to the desirability of constructing the main features of the aqueduct to full-size in the beginning. Plans for construction should proceed upon that basis.

Very truly yours,

F. E. Weymouth
Chief Engineer

May 4, 1931.

higher. Any possible saving is more than offset by operating disadvantages. This is true for either full or partial development. Such a line should receive no further consideration.

3. Bennett's high lift "regenerative" power plan is without merit. It should be given no further consideration.

4. Should the "regeneration" of peak power in connection with the operation of the aqueduct ever become desirable, which is unlikely, it can be accomplished more readily on a San Gorgonio Pass line than by Bennett's scheme. No such plan is advisable at the present time and no advance preparation is necessary. No further consideration should be given to such a plan at this time.

5. Consideration of ultimate economy points definitely to the desirability of constructing the main features of the aqueduct to full-size in the beginning. Plans for construction should proceed upon that basis.

Very truly yours,

F. E. Weymouth
Chief Engineer

May 4, 1931.

Table 1/

Comparative Costs

PARKER & ALL-AMERICAN ROUTES

Main Aqueduct to Cajalco Only

1905 Sec. Ft. Peak Diversion

Route	Parker	All-American-Lake Fenster	All-American-Lake Hemet	All-American-Lake Hemet
Estimate Number	128	114	118	116
Load Factor, Return Power Plants	-	100%	80%	80%
Construction Cost, Aqueduct	134,180,000	98,805,000	104,488,000	109,838,000
Storage Cost, Intermediate Construction Costs	1,198,000	11,500,000	11,500,000	11,500,000
Power & Pumping Plants	34,100,000	94,883,000	105,555,000	112,187,000
Total Construction Cost	169,478,000	205,188,000	219,960,000	233,980,000
Present Value of Perpetual Operation Including Power Bought	131,961,000	245,774,000	258,207,000	269,181,000
Total Construction Cost Plus Present Value of Perpetual O. & M.	300,893,000	418,962,000	478,067,000	491,071,000
Present Value of Return on Power Sales	-	96,808,000	58,074,000	57,982,000
Net Comparative Cost	300,893,000	413,970,000	419,463,000	433,089,000
Net Annual Operating Charge	6,514,000	11,487,000	10,928,000	10,595,000
Average Cost of Water During Redemption Period, per A.F.	24.29	33.72	34.80	34.96
Average Cost of Water after Bonds are Redeemed, per A.F.	6.65	11.40	10.80	10.34

Table 1

Comparative Costs

PARKER & ALL-AMERICAN ROUTES

Main Aqueduct to Cajalco Only

1605 Sec. Ft. Peak Diversion

Route	Parker	All-American-Lake Henshaw	All-American-Lake Henshaw	All-American-Lake Henshaw
Estimate Number	122	114	115	116
Load Factor, Return Power Plants	-	100%	50%	33%
Construction Cost, Aqueduct	134,180,000	98,805,000	104,625,000	109,233,000
Storage Cost, Intermediate Construction Costs	1,172,000	11,500,000	11,500,000	11,500,000
Power & Pumping Plants	34,100,000	94,823,000	103,535,000	112,187,000
Total Construction Cost	169,452,000	205,128,000	219,660,000	232,920,000
Present Value of Perpetual Operation Including Power Bought	131,241,000	245,774,000	252,377,000	258,151,000
Total Construction Cost Plus Present Value of Perpetual O. & M.	300,693,000	450,902,000	472,037,000	491,071,000
Present Value of Return on Power Sales	-	36,932,000	52,574,000	67,083,000
Net Comparative Cost	300,693,000	413,970,000	419,463,000	423,988,000
Net Annual Operating Charge	6,614,000	11,463,000	10,932,000	10,396,000
Average Cost of Water During Redemption Period, per A.F.	24.29	33.72	34.39	34.96
Average Cost of Water after Bonds are Redeemed, per A.F.	6.65	11.40	10.87	10.34

Table 1

Comparative Costs

PUMP & ALL-AMERICAN EQUIPS

Main Aqueduct to Catalco Only

1906 Spec. 7% Peak Diversion

Route	Parker	All-American Lake Havasu
Estimate Number	125	118
Load Factor, Return Power Plants	100%	100%
Conveyance Cost, Intermediate Storage & Pumping Plants	124,130,000	98,805,000
Conveyance Cost	1,172,000	104,695,000
Power & Pumping Plants	24,100,000	11,500,000
Total Conservation Cost	149,442,000	205,195,000
Present Value of Perpetual Operation	481,241,000	219,695,000
Total Perpetual Power Bought	450,903,000	225,377,000
Total Conservation Cost Plus Present Value of Return on Power	932,144,000	445,072,000
C. & M.	-	57,258,000
Present Value of Return on Power	8,814,000	10,252,000
Sales	500,695,000	24.39
Most Competitive Cost	24.39	24.39
Average Cost of Water Put Into Reclamation Cost of Water after Pumps are Reduced, Put A.F.	25.75	10.84
	11.40	10.87
	6.65	10.84

Table 2

Comparative Costs

PARKER & ALL-AMERICAN ROUTES

Main Aqueduct to Cajalco Only

803 Sec. Ft. Peak Diversion

Route	Parker	All-American-Lake Henshaw	All-American-Lake Henshaw	All-American-Lake Henshaw
Estimate Number	125	117	118	119
Load Factor, Return Power Plants	-	100%	50%	33%
Construction Cost, Aqueduct	102,965,000	71,599,000	74,224,000	77,312,000
Storage Cost, Intermediate	1,172,000	11,500,000	11,500,000	11,500,000
Construction Cost, Power & Pumping Plants	18,875,000	55,573,000	58,816,000	62,604,000
Total Construction Cost	123,012,000	138,672,000	144,540,000	151,416,000
Present Value of Perpetual Operation, Including Power Purchased	93,947,000	150,684,000	153,310,000	157,348,000
Total Construction Cost, plus Present Value of Perpetual O. & M.	216,959,000	289,356,000	297,850,000	308,764,000
Present Value of Return Power Sales	-	21,406,000	29,987,000	38,548,000
Net Comparative Cost	216,959,000	267,950,000	267,863,000	270,216,000
Net Annual Operating Charge	4,364,000	6,291,000	5,969,000	5,737,000
Average Cost of Water During Redemption Period, Per A.F.	27.13	33.31	33.43	33.85
Average Cost of Water After Bonds are Redeemed, Per A.F.	9.32	13.33	12.65	12.16

Table 3

Comparative Costs

PARKER & ALT-AMERICAN ROUTES

Main Aqueduct to Ogalee Only

805 Sec. Ft. Peak Diversion

Parker	125	117	Alt-American
Estimate Number			Lake Herndon
Load Factor, Return Power	-	80%	80%
Plant	102,965,000	74,999,000	74,814,000
Conductor Cost, Aqueduct	1,172,000	11,800,000	11,500,000
Storage Cost, Intermediate			
Compensation Cost, Power &	18,875,000	58,813,000	69,004,000
Pumping Plants	125,012,000	138,672,000	152,348,000
Total Construction Cost			
Present Worth of Deferred	93,947,000	120,884,000	109,284,000
Operation, Including			
Power Purchased	215,959,000	259,556,000	261,632,000
Total Commutation Cost, Plus			
Present Value of	309,906,000	380,440,000	370,916,000
Permanent Value O. & M.			
Present Value of Return	5,250,000	27,900,000	27,900,000
Power Sales	-	21,600,000	21,600,000
Net Comparative Cost	304,656,000	286,940,000	271,416,000
Net Annual Operating Charges			
Average Cost of Water During	27.73	25.41	24.04
Redemption Period,			
Per A.F.			
Average Cost of Water after			
Bonds are Redeemed,			
Per A.F.	9.33	8.33	7.51

Table 3

Comparative Construction Costs

FULL AND HALF-SIZE DEVELOPMENTS

PARKER ROUTE WITH DIVERSION DAM

Main Aqueduct only, Parker to Cajalco

Full-sized main features originally				Half-size initial development all features		
Possible Development 2nd Develop-ment years	Cost, 1st Development	Present Worth 2nd Development 4¾% Int.	Total Present Value, Ult.	Cost, 1st Development	Present Worth 2nd Development 4¾% Int.	Total Present Value, Ult. Development
0	$156,852,000	$12,600,000	$169,452,000	$123,012,000	$99,663,000	$222,674,000
5	156,852,000	9,992,000	166,844,000	123,012,000	79,023,000	202,034,000
10	156,852,000	7,925,000	164,777,000	123,012,000	62,658,000	185,669,000
15	156,852,000	6,281,000	163,133,000	123,012,000	49,682,000	172,693,000
20	156,852,000	4,981,000	161,833,000	123,012,000	39,396,000	162,407,000
21	156,852,000	4,755,000	161,607,000	123,012,000	37,613,000	160,625,000
30	156,852,000	3,131,000	159,983,000	123,012,000	24,766,000	147,778,000
40	156,852,000	1,969,000	158,821,000	123,012,000	15,577,000	138,589,000
50	156,852,000	1,237,000	158,089,000	123,012,000	9,787,000	132,799,000
60	156,852,000	779,000	157,631,000	123,012,000	6,159,000	129,171,000

Table 3

Comparative Construction Costs

MUL AND HALF-SIZE DWELLINGS

PAPER MOUTH WITH EXPANSION DAM

Main spillway only; Payout to capital

Full-sized dwelling originally ... Half-size Initial development with features

Possible Development Months	Present Worth 2nd Development Cost, 1st Development		Present Worth Total Present Value, Uni		Present Worth 2nd Development Cost, 1st Development		Model Present Value, Uni	
	Cost, 1st Development	% Int:		% Int:		% Int:		% Int:
0	$158,000,000	8,000	$158,000,000	8,000	$158,000,000	8,000	$158,000,000	8,000
5	158,000,000	7,925	158,000,000	7,925	158,000,000	7,925	158,000,000	7,925
10	158,000,000	7,851	158,000,000	7,851	158,000,000	7,851	158,000,000	7,851
15	158,000,000	7,778	158,000,000	7,778	158,000,000	7,778	158,000,000	7,778
20	158,000,000	7,707	158,000,000	7,707	158,000,000	7,707	158,000,000	7,707
30	158,000,000	7,569	158,000,000	7,569	158,000,000	7,569	158,000,000	7,569
40	158,000,000	7,436	158,000,000	7,436	158,000,000	7,436	158,000,000	7,436
50	158,000,000	7,309	158,000,000	7,309	158,000,000	7,309	158,000,000	7,309
60	158,000,000	7,187	158,000,000	7,187	158,000,000	7,187	158,000,000	7,187

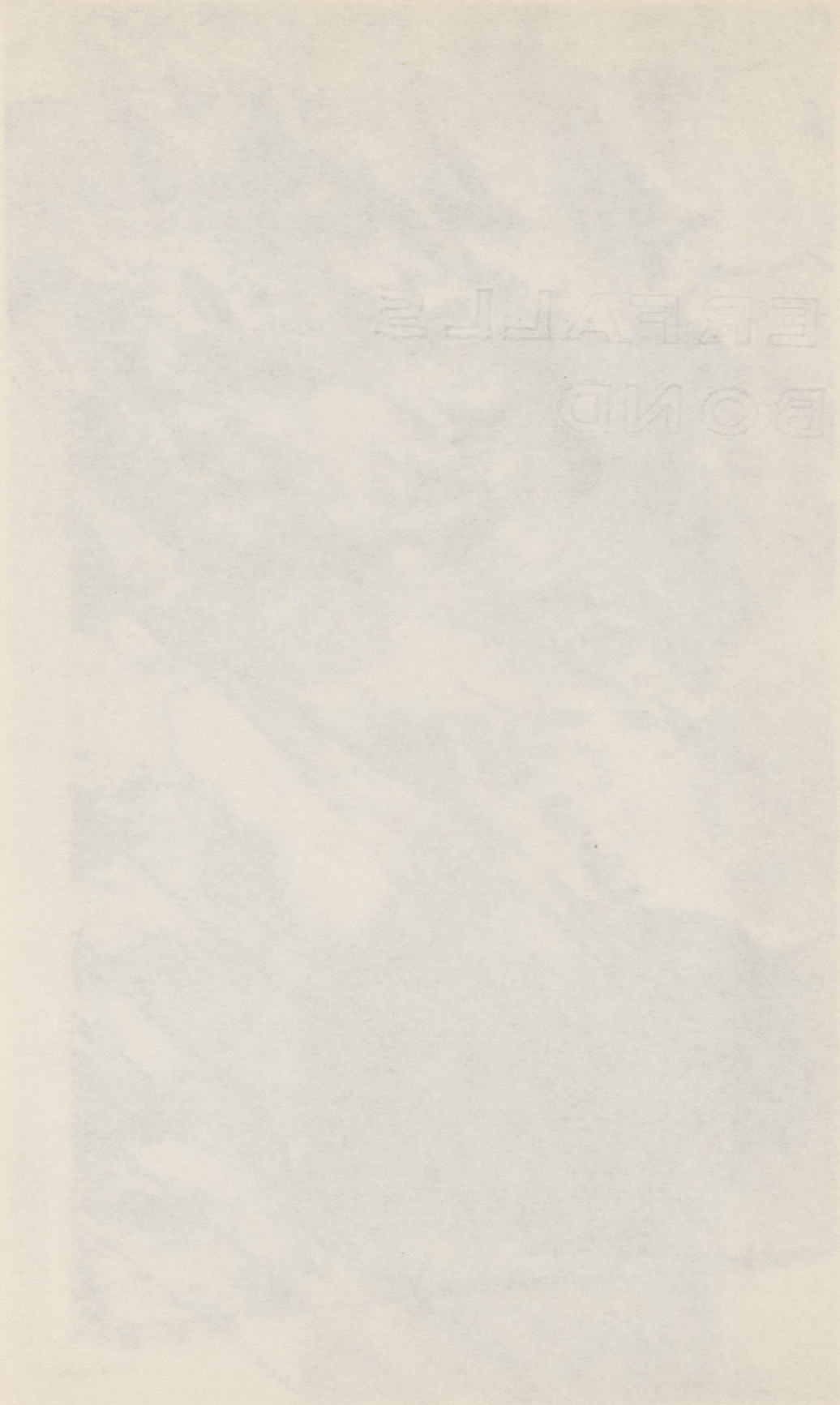


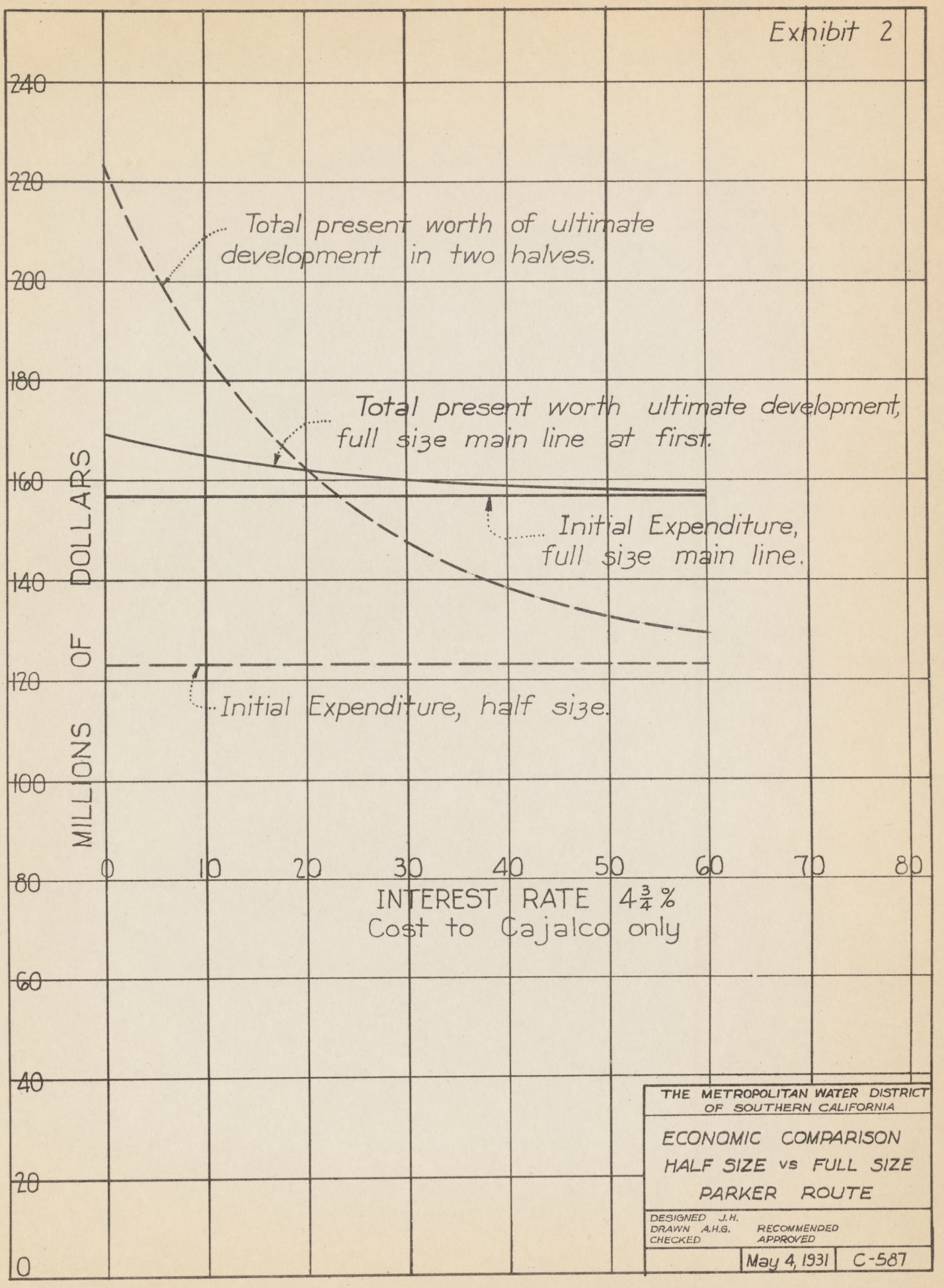
EXHIBIT 1


HAYFIELD
RESERVOIR
SAN
ANDREAS
SALTON
SEA
FAULT
BOB
FAULT
"P"
"R"
D
116
"R"
"P"
BOB
116
COMMONS.

EXHIBIT 1


RODEO RESERVOIR
CAJALCO RESERVOIR
MURRIETTA RESERVOIR
NIGGER VALLEY RESERVOIR
LAKE HENSHAW RESERVOIR
HAYFIELD RESERVOIR
SAN JACINTO
SAN ANDREAS
SALTON SEA
ELSINORE FAULT
FAULT
FAULT
122
116
126
80B
PACIFIC OCEAN
THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
PHOTOGRAPHIC MAP
PARKER AND ALL-AMERICAN CANAL
ROUTES
10 0 10 20 30 40
SCALE IN MILES
PHOTOGRAPHED BY, JNO. P. COMMONS.

Exhibit 2



THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

ECONOMIC COMPARISON
HALF SIZE vs FULL SIZE
PARKER ROUTE

DESIGNED J.H.
DRAWN A.H.G.
CHECKED
RECOMMENDED
APPROVED

May 4, 1931 | C-587

